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Volume
in memoria di
Marcello La Greca

a cura di:
Paolo Fontana e Bruno Massa

Marcello La Greca (Catania, 1999)

Memorie Soc. entomol. ital., 82 (2): 275-281 *30 giugno 2004*

Paolo FONTANA & Bruno MASSA

Marcello La Greca: the shoulders of a giant

Abstract - The figure of Marcello La Greca, his studies, researches, relations with the Italian and international scientific world are here recalled.

Riassunto - *Marcello La Greca: le spalle di un gigante.*
Viene qui ricordata la figura di Marcello La Greca, i suoi studi, la sua instancabile attività di ricerca, i suoi rapporti con il mondo scientifico italiano e internazionale.

The spirit which inspired this issue of *Memorie* of the Società Entomologica Italiana, devoted to the memory of Marcello La Greca, may be shortly summarised with the famous sentence written by Isaac Newton in 1676 in a letter to Robert Hook, *If I have seen farther it's by standing on the shoulders of giants*. Marcello La Greca undoubtedly was, among zoologists, a giant, and his findings, his intuitions and his untiring scientific work consented then and consent nowadays many naturalists to make progress, to perceive and watch much farther. He was a zoologist of a very wide view and his strong shoulders of taxonomist, ecologist, evolutionist, biogeographist and conservation biologist today let us to go toward ways by him covered with enthusiasm, which did not leave him until the last day of his life. His wish to actively partecipate to the life of scientific community is testified by his membership to many italian and international scientific associations, by his constant and active partecipation to congresses, workshops and research projects, and by his frequent exchange of letters (and more recently e-mail) with the most famous scientists of his time, among whom we wish to cite the well known orthopterologists G. Y. Bei-Bienko, Lucien Chopard, Willy Ramme and Boris Uvarov.

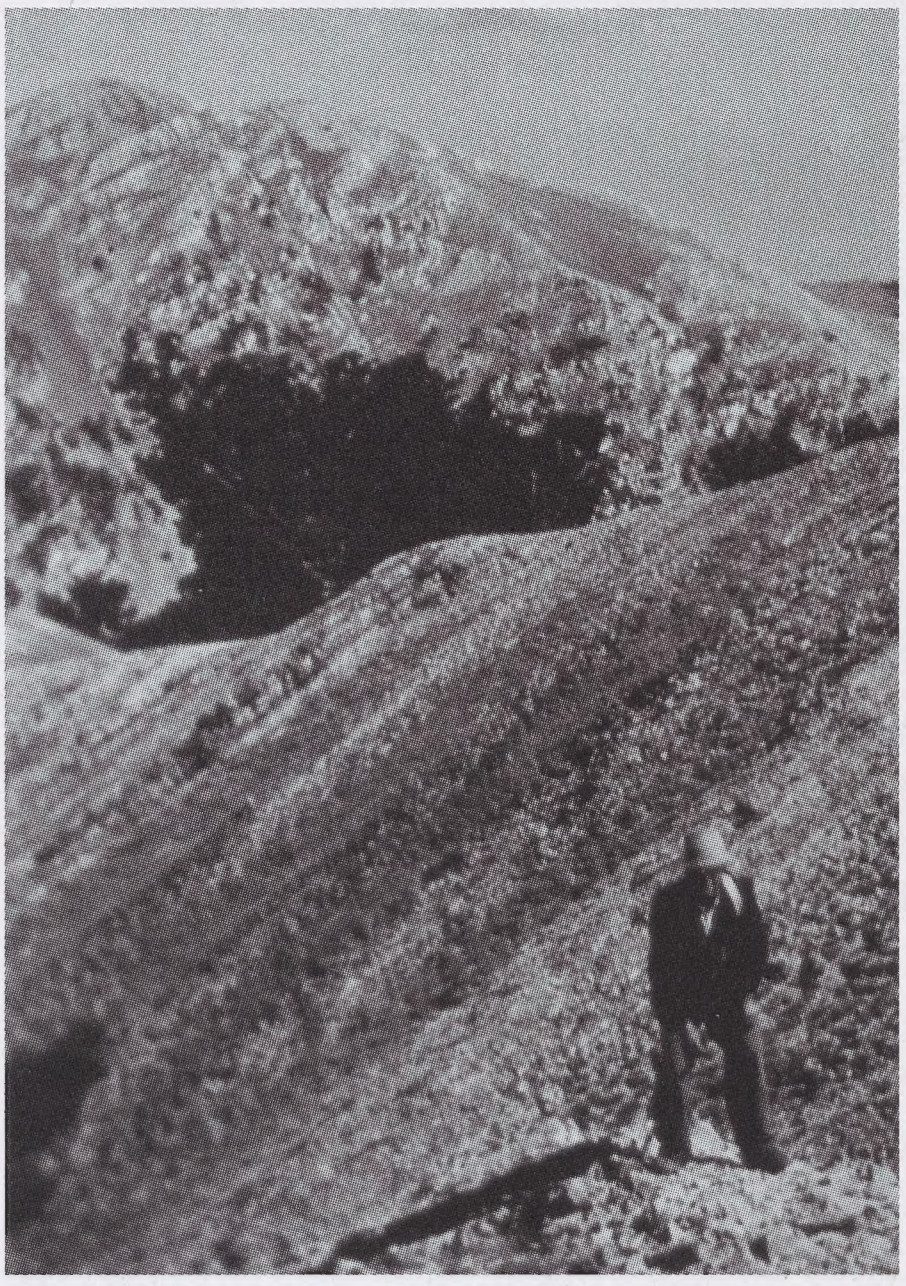
During the 62 years of his scientific activity, La Greca explored many research themes, all fascinating, like biospeleology, morphology and systematics of Annellida Polychaeta, morphology of the Insect cuticle, biogeography, taxonomy, systematics and phylogenesis, particularly of Orthoptera and Mantodea. He was also actively involved in the environmental politic for at least thirty years, and, for this reason, he kept intense relationships with schools, through the Associazione Nazionale Insegnanti di Scienze Naturali (National Association of Natural Sciences Teachers). The echo of his lecture on "Environmental Politic and School", presented in Sorrento in the late 70', was surely perceived by many people. He was for many years member of the Consiglio Regionale per la Protezione del Patrimonio Naturale (Regional Committee for the Protection of Natural Resources), as well as one of the people who signed the Regional Plan of Nature Reserves and Parks in Sicily; besides, he took part in the work group involved in the preparation of the Territorial Plan of Etna Park, for many years he was member of the Consiglio Regionale per i Beni Culturali ed Ambientali (Regional Committee for Environmental and Cultural Resources), and was also President of the Province Commission for the Environment at the Catania Province. His efforts in battles for the conservation of natural habitats,

mainly in Sicily, derived from the awareness of the peculiarity of some taxa and the unique and incredible natural history they can recount to those who are able to understand it.

Along his long scientific activity, lasting 62 years, between 1938 and 2000, he published 290 scientific articles on the themes above quoted. Nevertheless, La Greca was mainly an entomologist, particularly orthopterologist; we may assert, out of any rethoric, that La Greca certainly was the biggest among the italian and one of the biggest orthopterologists in the world living in the last 50 years. Italian orthopterological tradition is very old and his fundaments are well strong; Marcello La Greca placed himself into the groove of this tradition, as he often wished to remind, both during private conversations and conferences. "*E si capisce*" La Greca would have said, with his slight Neapolitan accent, preserved after tens of years spent in Sicily, which gave to his speaking a bright and friendly tone. Just his University studies in Neaples, where Mario Salfi (1900-1970) was working, author of many papers on Orthoptera, and probably even more, the facility to study and watch the material preserved in the collections of Achille Costa (1823-1898), left an indelible track to him and generated his strong passion for grasshoppers. In fact, when he was speaking about species described by Achille Costa or by his father Oronzio Gabriele Costa (1787-1867), or about localities frequented during their pioneeristic expeditions to the most wild zones of the Borbonic Italy of XIX century, he was doing it with such a familiarity that time barriers vanished, becoming himself testimony of the wide heredity left from the great Neapolitan naturalists, authors, among other writings, of different parts devoted to Orthoptera in the Fauna del Regno di Napoli (1836-1874). He had the same feeling when, speaking about his orthopterological researches on Apennines, he seemed to wish to go again all over the findings of Adolfo Targioni Tozzetti (1823-1902), botanist and zoologist from Florence, who described many italian species of Orthoptera and published in 1882 "Ortotteri Agrari", an important synthesis on grasshoppers living on or damaging cultivated plants.

Then, italian orthopterological tradition was very solid; we could name only some of the most famous orthopterologists, like the unlucky entomologist Alfredo Borelli (1857-1943), one of the most experienced dermapterologists of all times, and Ermanno Giglio Tos (1865-1926), author of many papers on grasshoppers, and, above all, author of the volume Mantidae (1927) in the series Das Tierreich, posthoumus important work of 700 pages, where all the species, then known, are treated and keyed. We could also cite the work of Ruggero Cobelli (1838-1921), basic study for the knowledge of Orthoptera of eastern Alps, which contributed remarkably to the identification of Podismini, so much studied and biogeographically interpreted by La Greca. Again, we remind Giuseppe Jannone (1907-1971), coming from the neapolitan scientific atmoshere which provided with solid foundations the orthopterological school, who studied grasshoppers in southern Italy, Palestina, Libya and East Africa, facing also the problem of acridological invasions with a powerful and detailed monography on *Dociostaurus maroccanus* (1939).

They, and certainly many other precursors, influenced remarkably the scientific activity of Marcello La Greca, as we may observe reading his wide production; but probably he influenced even more his contemporaries, receiving stimulating teachings in return. In fact he was lucky to work together other italian orthopterologists, who contributed or are still contributing very much to the study of these insects, each of them



Marcello La Greca on Serra del Prete
(3th August 1950)
Marcello La Greca sulla Serra del Prete
(3 agosto 1950)

following their own peculiar way, but all associated by the great passion and devotion to scientific research and from reciprocal esteem; only to cite the greatest, we could remember the late Felice Capra (1896-1991), Baccio Baccetti and Antonio Galvagni.

The present volume, which brings together original papers of orthopterologists from different countries of the world, is entirely devoted to Orthopteroidea, just in the the awareness that La Greca, in his life of scientist, emotionally and scientifically favourited this systematic group; with this opportunity we pay a homage to a master, whose approach to the study of insects was very peculiar and original, marking a new zoological-biogeographical style.

The biogeography owes very much to La Greca, who, with the codification of geographical distribution models, processed in the 60', and still valid from a general point of view, laid the germ which produced a scientific vein, particularly in Italy, very profitable and rich in passionate debates. Many fascinating interpretations on the origin and composition of mediterranean fauna arose from this germ. M. La Greca described 70 new taxa, mainly Orthoptera and Mantodea, but his aim was never the simple systematic description, but rather putting systematic order to go deeper biogeographical researches. He considered these insects as living being, with peculiar requirements and bearers of an old history in their DNA. Then, he studied much their ecology and the origin of their populations, going in depth, as a pioneer, biogeographical and zoosociological aspects. Today it is impossible to treat these themes without reading his writings.

His cultural contribution was not addressed only to specialists; La Greca, always maintaining the scientific accuracy, succeeded to communicate new concepts and opin-

ions using easy words. If the Zoology nowadays is considered an "alive" discipline, a good part of this success is due to La Greca, who introduced it following a phylogenetical point of view, neglecting the old "classification" model, which, mainly in the 70', was the main reason of loss of interest by many students of different italian Universities. His Zoology was not a mnemonic discipline, once much "feared" by students, but a science, where morphology, eco-etology and evolution overlap, merging in one biological science.

La Greca was always surrounded by valid students, able to follow his traces and to come with him along that wonderful trip, represented by the scientific research; those who had the chance to do together with him a small stretch, shall have him always as companion of this fascinating trip. His deep conscience of past cultural roots, his great awareness of the present and his look to the future are the characteristics of a strong and benevolent giant, well placed in the Science Temple, on whose shoulders many of us now may find a valid support to look through, to see farther.

ACKNOWLEDGEMENTS

We thank very much all the Authors, who partecipated with enthusiasm to the achievement of this modest "homage" devoted to the memory of Marcello La Greca, both for their collaboration and patience shown during the preparation of this issue. We wish also to thank the referees, for the attention paid in the reading of texts, the Secretary of the Redaction, Stefano Zoia, and the President of the Società Entomologica Italiana, Augusto Vigna Taglianti, respectively for the aid and trust grant. We also thank particularly Mrs Caterina Meduri La Greca, who permitted us to accede to manuscripts, writings and personal photographs of his husband. Finally, we thank also Valentina Lo Verde and Maria Grazia Tornabene who edited some linguistic revisions.

Marcello La Greca: le spalle di un gigante

Lo spirito di questo volume delle *Memorie* della Società Entomologica Italiana, dedicato a Marcello La Greca, può essere riassunto nella celebre frase scritta da Isaac Newton nel 1676 in una lettera a Robert Hook, *If I have seen farther it's by standing on the shoulders of giants*. Marcello La Greca è stato indubbiamente, tra gli zoologi, un gigante, e le sue scoperte, le sue intuizioni ed il suo instancabile lavoro hanno permesso e permettono ancora oggi a molti altri naturalisti di progredire, di vedere ancora più lontano. È stato uno zoologo di ampissima valenza e le sue robuste spalle di sistematico, ecologo, evoluzionista, biogeografo e biologo della conservazione ci permettono oggi di continuare verso molte direzioni le strade da Lui intraprese con un entusiasmo, che non l'ha mai lasciato fino all'ultimo giorno di vita. La sua voglia di partecipare attivamente alla vita della comunità scientifica è testimoniata dalla sua adesione a molte associazioni italiane ed internazionali, dalla sua estesa corrispondenza con i più grandi studiosi del suo tempo, tra i quali L. Chopard, B. Uvarov e G. Y. Bei-Bienko, e dalla sua assidua partecipazione a congressi e progetti di ricerca.

Nei 62 anni della Sua attività, La Greca si occupò di numerosi temi di ricerca, tutti affascinanti, biospeleologia, morfologia e sistematica degli Anellidi Policheti, morfologia del dermascheletro degli Insetti, biogeografia, tassonomia, sistematica e filogenesi, in modo particolare di Ortotteri e Mantodei. Si occupò anche attivamente di politica ambientale per almeno trentanni; proprio per questo scopo tenne rapporti molto stretti con le scuole, attraverso l'Associazione Nazionale Insegnanti di Scienze Naturali; certamente a molti è giunta l'eco del successo del Suo intervento su "Politica ambientale e scuola", presentato a Sorrento alla fine degli anni '70. Fu per molti anni membro del Consiglio Regionale per la Protezione del Patrimonio Naturale, nonché tra gli estensori del Piano Regionale delle Riserve e dei Parchi in Sicilia; fece parte del gruppo di lavoro per la redazione del piano territoriale del Parco dell'Etna, per molti anni fece parte del Consiglio Regionale per i Beni Culturali ed Ambientali, e fu anche Presidente della Commissione Provinciale per l'Ambiente della Provincia di Catania. Il Suo impegno in battaglie per la conservazione degli habitat naturali, particolarmente in Sicilia, è stato sempre dettato dalla consapevolezza dell'irripetibilità dei taxa e della incredibile storia naturale che possono narrare a chi sa interpretarla.

Sui temi di ricerca sopra citati pubblicò, tra il 1938 ed il 2000, 290 articoli. La Greca, tuttavia, fu soprattutto un grande entomologo, ed in particolare un ortotterologo; fuori da ogni retorica, si può certamente affermare che La Greca è stato il più grande ortotterologo nel panorama entomologico italiano ed uno dei più grandi degli ultimi 50 anni a livello internazionale. La tradizione ortotterologica italiana è molto antica e si basa su fondamenta alquanto solide, e Marcello La Greca si è inserito nel solco di questa tradizione, come Egli stesso spesso amava ricordare, sia in colloqui privati che in occasione di convegni. "*E si capisce*" avrebbe detto La Greca, con quella leggera inflessione partenopea, conservata pur dopo decenni trascorsi in Sicilia, che dava al suo parlare un tono brillante e confidenziale. Proprio i suoi studi a Napoli sotto la direzione di Mario Salfi (1900-1970), autore di molti contributi sugli Ortotteri, e ancor di più, la possibilità di accedere alle collezioni di Achille Costa (1823-1898), lasciarono una traccia indelebile su di Lui e generarono la Sua passione per gli Ortotteri. Infatti, quando parlava di specie descritte da Achille Costa o dal padre Oronzio Gabriele Costa (1787-1867), o di località toccate nei loro pionieristici viaggi nelle zone più selvagge dell'Italia borbonica del XIX secolo, lo faceva con una familiarità tale da far sfumare le barriere del tempo, divenendo Egli stesso portatore del testimone lasciato da questi grandi naturalisti napoletani, autori, tra le altre opere, delle diverse parti dedicate agli Ortotteri, della Fauna del Regno di Napoli (1836-1874). La stessa sensazione si aveva quando, parlando delle sue ricerche appenniniche, pareva voler ripercorrere le scoperte di Adolfo Targioni Tozzetti (1823-1902), botanico e zoologo fiorentino, che aveva descritto molte specie italiane di Ortotteri e pubblicato un volume dal titolo Ortotteri Agrari (1882).

La tradizione ortotterologica italiana era quindi solida; basti citare i nomi di Alfredo Borelli (1857-1943), sfortunato entomologo italiano ed uno tra i più grandi esperti di Dermatteri di tutti i tempi e di Ermanno Giglio Tos (1865-1926), autore di diversi contributi sugli Ortotteri ma soprattutto del volume Mantidae (1927) nella serie Das Tierreich, opera postuma di oltre 700 pagine, in cui risultano trattate, anche con chiavi dicotomiche, tutte le specie mondiali allora note. O ancora citare il lavoro di Ruggero Cobelli (1838-1921),

fondamentale per lo studio degli Ortotteri delle Alpi orientali, che, tra l'altro, contribuì notevolmente con le sue ricerche alla conoscenza di quei Podismini tanto studiati, e biogeograficamente interpretati, da La Greca. Ed infine, proveniente da quell'atmosfera scientifica napoletana che aveva dato solide basi ad una scuola ortotterologica, era anche Giuseppe Jannone (1907-1971), specialista di Ortotteri, che studiò nell'Italia meridionale, in Palestina, Libia ed Africa Orientale, affrontando anche il problema delle invasioni acridiche, con una poderosa e dettagliata monografia sul *Dociostaurus maroccanus* (1939).

Questi, ma certamente tanti altri precursori, hanno influito notevolmente sull'attività di ricerca di Marcello La Greca, come si può osservare nella sua estesa produzione scientifica, ma ancor di più forse Egli ha influito sui suoi contemporanei, ricevendone a sua volta stimoli e insegnamenti. Ha avuto infatti la fortuna di lavorare in sintonia con altri ortotterologi italiani, che hanno contribuito e stanno ancora contribuendo molto seriamente allo studio di questi insetti, ognuno con un proprio percorso, ma uniti dalla grande passione e dedizione per la ricerca e dalla stima reciproca; per citare i maggiori, ricordiamo Felice Capra (1896-1991), Baccio Baccetti e Antonio Galvagni.

Il presente volume, che riunisce contributi originali di ortotterologi di varie parti del mondo è stato interamente dedicato agli Ortotteroidei, proprio nella consapevolezza che La Greca, durante la Sua vita di scienziato, ha avuto una predilezione scientifica ed emotiva particolare nei confronti di questo gruppo sistematico e vuole essere l'occasione per rendere omaggio ad un maestro, il cui approccio allo studio degli Ortotteroidei è stato alquanto singolare ed originale, segnando in un certo senso uno stile zoologico-biogeografico nuovo.

La biogeografia deve certamente molto a La Greca, che, con la codificazione dei modelli di distribuzione geografica, elaborata negli anni '60, e tuttora valida nelle linee generali, consentì il germinare di un filone scientifico, in particolare in Italia, veramente proficuo e ricco di appassionati dibattiti. Da questo seme nacquero tante affascinanti interpretazioni sull'origine e la costituzione della fauna mediterranea. Descrisse ben 70 nuovi taxa, prevalentemente Ortotteri e Mantidi, ma la istituzione di nuovi taxa non era affatto la Sua meta; le sue revisioni sistematiche o le descrizioni di nuove specie avevano sempre l'obiettivo di colmare un vuoto, per poter affrontare più agevolmente le indagini bioeografiche. Egli considerava questi Insetti in quanto esseri viventi, dotati di esigenze contingenti e portatori nel loro DNA di una storia antica. Si occupò dunque molto della loro ecologia e dell'origine dei loro popolamenti, approfondendo come un vero pioniere gli studi biogeografici e zoosociologici. È impossibile trattare questi argomenti senza consultare i Suoi scritti.

Il Suo contributo culturale non è stato solo rivolto ad un pubblico di specialisti; La Greca, pur mantenendo il rigore scientifico, riuscì sempre a comunicare interpretazioni e concetti nuovi con parole facili. Se la Zoologia oggi è ritenuta una disciplina "viva" è in buona parte merito di La Greca, che la presentava secondo una visione filogenetica, abbandonando i vecchi modelli "classificatori", che, soprattutto negli anni '70, erano stati la causa primaria della perdita di interesse da parte di numerosi giovani studenti in molti Atenei. La Sua Zoologia non è la disciplina mnemonica, un tempo tanto "temuta" dagli studenti, ma una scienza, in cui morfologia, eco-etologia ed evoluzione si sovrappongono, divenendo un'unica scienza biologica.

La Greca si è sempre circondato di validi allievi, capaci di seguire le sue orme ed accompagnarlo in quel viaggio meraviglioso che è la ricerca scientifica; chi ha avuto la ventura di fare con Lui un tratto di strada, lo avrà per sempre come compagno di viaggio. La sua profonda coscienza delle radici culturali del passato, la sua grande consapevolezza del presente ed il suo sguardo al futuro, fanno di Marcello La Greca un solido e benevolo gigante, ben piazzato nel Tempio della Scienza, sulle cui spalle molti di noi oggi possono trovare un valido appoggio per guardare oltre, per guardare lontano.

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Baccio BACCETTI & Sandro RUFFO

In Memory of Marcello La Greca

Abstract - Marcello La Greca (Cairo, Egypt, 1914 - Catania, Italy, 2001) is here remembered through the history of his life, from his studies at the Naples University to the late days of his existence.

Riassunto - *In ricordo di Marcello La Greca.*
Marcello La Greca (Cairo, Egitto, 1914 - Catania, Italia, 2001) è qui ricordato tramite la storia della sua vita, dai suoi studi presso l'Università di Napoli ai suoi ultimi giorni.

Eminent fellows, dear friends, one detects clearly, around us, the solemnity of this ceremony devoted to commemorate Marcello La Greca in front of his family and of many Italian scientists who were on friendly terms with him or collaborated with him. One feels, actually, the sensation and the emotion of trying to reconstruct the personality of one of the best Italian naturalists of our time, a very good friend throughout our careers and, to a great extent, our lives.

Marcello La Greca was born in Cairo, Egypt, on the 8th of December 1914. He attended the elementary and the secondary Italian school in Alexandria and in Cairo (in those years the Italian community in Egypt was in fact very large). His father, Stanislao, a Neapolitan of noble origins, worked in construction companies, with alternating fortune; his mother Clotilde Paggi came from Livorno. We have very little information about the Egyptian years, also because he was very reluctant to speak about himself and his life. However, we know that he was a very brilliant student and that he passed his final exams with excellent marks. As the economic situation of his family was rather difficult, he worked, as a student, in order to help his beloved father and in order to spare the money he needed to realize his dream to get a degree in Italy, in Naples, in Natural Sciences, for which he had a strong bent. He was very fond of deserts, which fascinated his innate naturalistic spirit, and in the desert he made his first experiences as an entomologist, observing and collecting insects.

Once he arrived in Naples he matriculated at the faculty of Natural Sciences, as he had always dreamed, and in 1938 he graduated with honors. He immediately decided to carry on with the study of Zoology, to which he devoted his whole life. At that time the director of the Zoological Institute of Naples was Professor Umberto Pierantoni, a charismatic figure in the Neapolitan culture, well-known for his cytological studies on endosymbionts.

The Institute had been very famous throughout the world for a long time. From the end of the XVIII century and through the XIX the following scientists had directed it or had worked there: Domenico Cirillo, Saverio Macrì, Giosué Sangiovanni, Giuseppe Saverio Poli, Filippo Cavolini, Luigi Petagna, Stefano Delle Chiaie, Oronzio G. Costa, Achille Costa, Antonio Della Valle, Francesco Saverio Monticelli. Some of them had also researched into marine biology and were in close connection with the

Zoological Station which had been founded and sustained by the Dohrn dynasty.

The library of the Institute was excellent, but not so the equipment, according to the times, the staff very scanty, the premises in the dark rooms of Via Mezzocannone were grey, chilly in wintertime and big enough to house one of two University Zoological Museums in Southern Italy (the other one was in Palermo); but an endless passion seemed to seep, together with dampness, through the walls and the furnishing. As La Greca himself told us in recent years, commemorating his old colleague De Lerma, Pierantoni used to entrust each student preparing a dissertation thesis with a zoological subject or a part of it. At that time they studied Mole-crickets. The sympathetic nervous system was allotted to De Lerma, who was his assistant, while the muscular system, including its innervation, was given to La Greca. The results of the research, of pure functional morphology, were published in 1938 in the 38th volume of "Archivio Zoologico Italiano" extending to more than a hundred pages. Thus La Greca, stimulated by the experience on Mole-crickets, specialized in Orthoptera. He turned his attention to the African and South-American Mantodea of some small Italian collections (Edoardo Zavattari, Nello Beccari, Giuseppe Russo, Filippo Silvestri, Lidio Cipriani) which had been left unidentified and he published the relevant results in seven papers between 1938 and 1939: on the whole six new species were described. During this Neapolitan period La Greca broadened his scientifical horizons more and more by attending the Zoological Station in Naples, the Institute of Filippo Silvestri in Portici and, in Via Mezzocannone, Father Giuseppe Zirpolo, an enthusiast hydrobiologist who was a former student of Monticelli and Pierantoni. In the same period La Greca began to teach in the secondary school and in 1940 he passed a competitive exam for assistant lecturer of Comparative Anatomy.

The tragic event of the war affected heavily La Greca, as well as many others of his age, crushing all the expectations of his youth. He was mobilized in 1940 as an artillery officer and was later promoted to captain. In September 1943 the unlucky armistice surprised him in Germany where, having refused to join the army of the Republic of Salò, he was imprisoned in the fortress of Leopoli, in the martyred country of Galizia, first Austrian, then Polish and German and now Ukrainian. Here he became a friend of one of us (S. R.), sharing together two long years of imprisonment. This friendship helped both of them to get over the endless days spent first in Leopoli, and later, as the Russian troops approached the eastern front, in the camp of Wietzendorf, a little village near Hannover and Hamburg, reached after six dreadful days inside a cattle-train in the depths of a chilly winter. His constitution was strong but the torments of cold and hunger undermined his health. In the second winter (1944-45) a nasty cough troubled him, making his friends fear the worst. In February 1945, suddenly, the Germans sent them to prison in Hamburg, where they arrived during the night, but on the way Marcello lost all his poor belongings of a prisoner. During the day they had to do manual work: first as snow-ploughs, then as learners in a school of "fine mechanics", under the guidance of a "meister" who was almost more fed up with war than his pupils. Every night the gloomy sound of the air raid sirene rang out and the Allied bombardments destroyed the unhappy Hamburg, which became a ghost town. In this period, during a medical examination, Marcello found out that he was suffering from pulmonary tuberculosis.

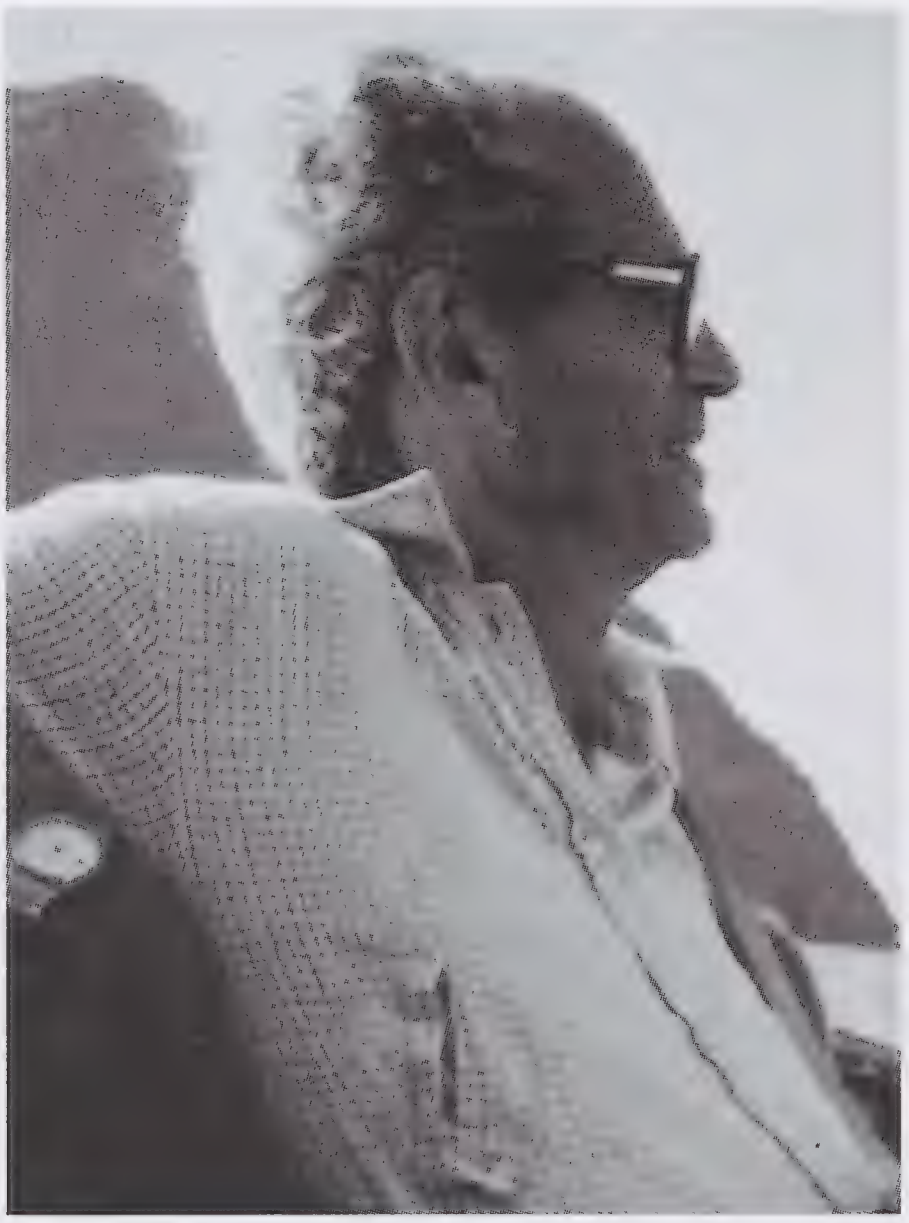

Fig. 1. Marcello La Greca.

Fig. 3. In the Valle del Tusciano.

Fig. 2. Student's report book of Marcello La Greca.

Fig. 4. Visit to the Cave Spartiglioni (year 1949).

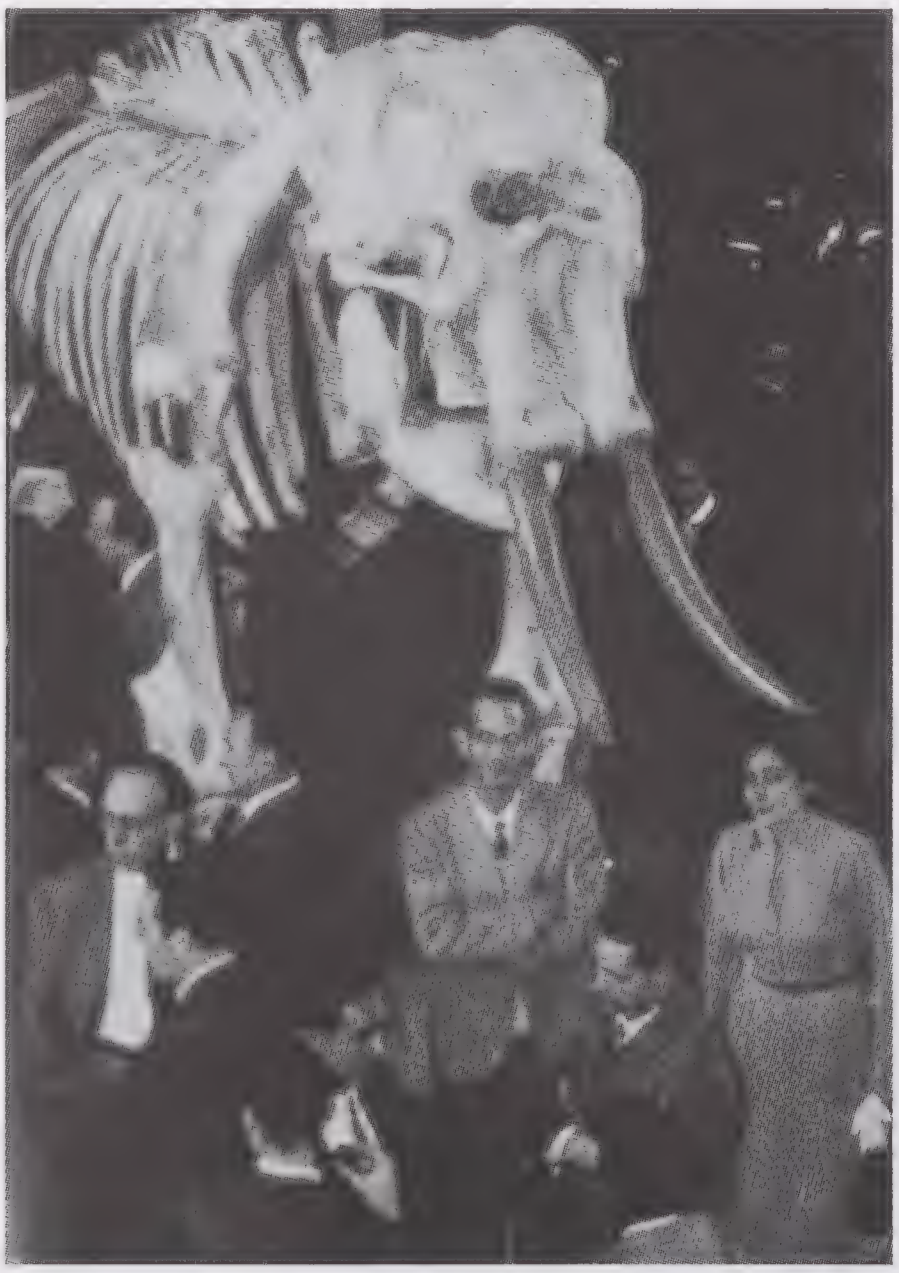

Fig. 5. In the XXVIII Congress of Unione Zoologica Italiana (20 October 1956).

In May 1945 Hamburg was freed by the English and in the following August the unlucky friends eventually came back to Italy, deeply scarred in their bodies and minds by the terrible experience of the war years.

At the end of 1945, after five years of lost activity, La Greca came back to the Institute of via Mezzocannone, where Mario Salfi held the chair of Comparative Anatomy and later, in 1949, he moveed to the Institute of Zoology, after the retirement of Umberto Pierantoni. Salfi helped and supported La Greca in his career in a period when the Roman school of Giulio Cotronei and the Florentine one of Nello Beccari dominated the small world of Italian zoology, deaf to naturalistic research.

Soon after coming back from the war, on the 28th of November 1945, he read at the Society of the Naturalists in Naples a paper on the alary articulation in Orthoptera, studied from a morphological and

Fig. 6. Marcello La Greca.

Fig. 7. At Verona on 28 February 1961.

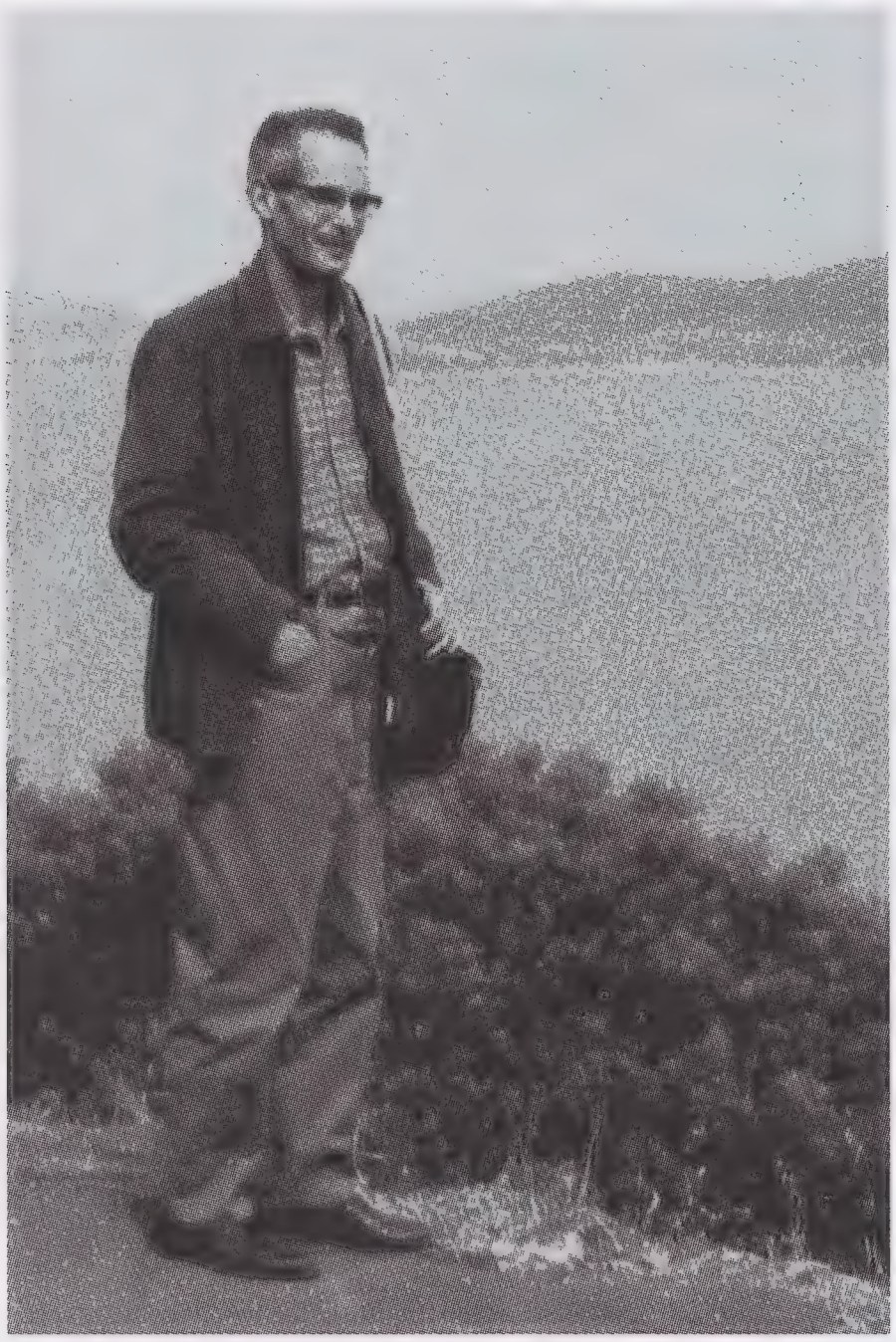

Fig. 8. At Alghero during the Congress of Società Italiana di Biogeografia (May 1964).

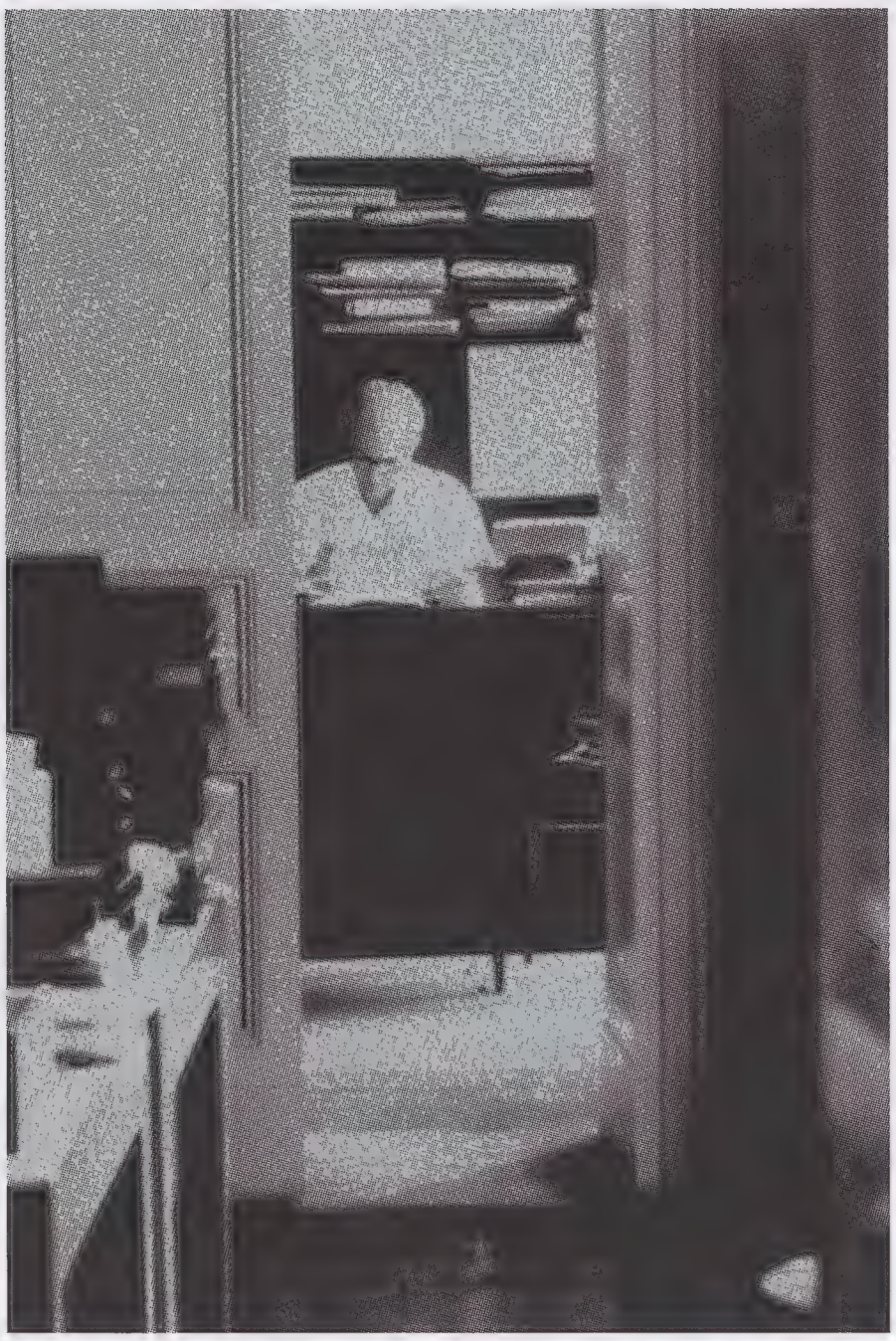

Fig. 9. The office of Marcello La Greca (year 1999).

comparative point of view in many brachypterous and micropterous species. His strict comparative analysis demonstrated that there are species in which axillary sclerites are always modified and reduced in relation to their alary reduction, and species which, in the same conditions, maintain normal axillary sclerites. Thus he introduces the contrasting concepts of genotypical micropterism and fenotypical micropterism, pointing out a line of research which he himself will follow reaching relevant results. He already showed his ability to summarize his observations in general conclusions able to explain evolutionary changes, but he will take advantage of this ability much later in his life.

Encouraged by Salfi, La Greca published a series of papers about teratological specimens of Orthoptera in the Salfi collection, and on that occasion he started studying regeneration in insects. At the same time he carried on detecting the alary reduction in Orthoptera connecting it with sex. He also carried out an experimental investigation on the phenomena of autotomy and rigeneration in a group of marine animals, Annelida Polychaeta Serpulidae. By attending the Zoological station of Naples, he also improved his mastery of histological technique. He was attracted also by the faunistics of Serpulidae and he started a series of works on the Polichaeta of the Neapolitan gulf describing, *en passant*, also two new species. All this occurred in one single year, 1946, when Marcello La Greca resumed his research work.

Fig. 10. On the Zoological Museum of Catania University.

In the following year (1947) he carried on his investigations on the functional morphology of wing articulation in Orthoptera discovering very important connections between the structures of the different thoracic sclerites and the wing-opening and closing movements. In this area he found an elastic, rubber-like structure, which he carefully described and which, some years later, Torkel Weis Fogh (1960, J. Exp. Biology, 37, cfr. p. 890) recognized as a new protein, the resilin, ascribing the priority of its observation to La Greca. The thing went unnoticed in Italian zoology, and today nobody knows or remembers it.

In the meantime La Greca, who did not immediately realize the relevance of his discovery, resumed field observations in the area of Naples, which were published in 1948. Among these there is a remarkable study on the deambulation of *Tropidopola*, an Acridomorpha living on the stalks of *Scirpus*. This unusual species, never previously found in Southern Italy, was examined in the morphological adaptations of its legs to palustral life. Remembering also his morphological studies on the neuromuscular system of insects carried out as a young man, in 1948 he described the nerves connected with the flight of Orthoptera.

In 1948 he described two new remarkable species, collected on the Matese mounts in 1947: one *Metaplastes*, found on the sides of the mountains, and *Chorthippus albicornis*, living at high altitude on the same mountains. This species, and other similar ones, will be included in a new genus created fifty years later. In this Neapolitan period Marcello La Greca was mostly an expert of functional morphology and a describer of new species. So far he had never dealt with evolution or biogeography. In 1949 he published the list, redescribing some species, of a beautiful collection of Polychaeta from the Bosphorus sent him by the University of Istanbul. The work was published on a periodical of that University.

La Greca continued to devote himself to the functional morphology of the pterothorax of insects, also in relation to the transformations connected with the alary reduction. Now he detected the problem in two Hemiptera, (*Pyrrhocoris*, 1949, and *Tropidothorax*, 1951), and in the praying Mantis, of which he examined integument and also the abdomen muscles. In the same year, 1949, he also published on the pleura of Isoptera, Zoraptera, Blattodea and Mantodea. But it will take more than thirty years before La

Greca published the fundamental synthesis on "Origin and evolution of the articulatory apparatus of Pterygota" (1982). In the meantime he carried on his faunistical-systematical research on tropical Mantodea. Edoardo Zavattari sent Salfi the Orthoptera collected during the Sagan-Omo expedition and the Mantodea are given to La Greca. He found thirty-one species, three of which, together with a local form, are new for science (Rivista di biologia Coloniale, vol. X, 1949-50). Felice Capra had also sent him the African Mantodea preserved in the Museum of Natural History of Genoa; La Greca published the list of them with the description of a new species. He personally explored the countryside of Southern Italy, namely the areas of Avellino and of Enna, finding some species new for Italy; in 1950 he published their list together with biogeografical observations. In the same year Edoardo Gridelli's well-known work on transadriatic species was published, heavily impressing both La Greca and all the other Italian naturalists. Thus, in 1951 he resolved to publish some papers summarising his biogeografical speculations. He started with Apennine Orthoptera, making use of the scanty bibliographical data available at that time, and of his own findings on the Matese and Pollino mountains. At first he distinguished among the different faunistic levels and the main distributional types, identifying the southern distributional limit of several endemic species, giving a highly appreciated lecture at the U.Z.I. meeting in Pisa. Later, still in 1956, he wrote a big work, in which he dealt with the different types of distribution and of origin of the most typical Orthoptera of the whole Apennine fauna.

At that time La Greca was already well-known for his acumen, his inventiveness, his depth of thought and his eagerness for tireless work, despite the insufficient means he had. The inventiveness is a feature of his on which we shall go back. We are now in the years 1952-53 when La Greca carried on publishing additional large recapitulatory works: one on West-African Mantodea of the British Museum, sent him by Uvarov (8 new species), one on the regeneration phenomena in Polychaeta Sabellidae. He also described *Rhacocleis tyrrhenica*, a new species of Decticinae collected on Zannone island. In 1952 he was appointed correspondent member of the National Academy of Entomology and he competed for the chair of Zoology at the University of Turin, getting a good valuation and, unanismously, the qualification, even if not the chair.

The committee was mainly constituted by naturalists, such as Alceste Arcangeli, Mario Benazzi, Giuseppe Colosi and Mario Salfi who were able to appreciate the topics investigated by La Greca. In 1953 La Greca, together with Guido Bacci, identified the genetic and morphological differences between two subspecies of *Ophryotroca puerilis*, one living in Naples (*puerilis*) and the other in Plymouth (*siberti*). The work was published in *Nature*. In 1954 he carried on publishing several works aiming at a full professorship, which he wished very strongly both for himself and for his family.

As regards Mantodea he studied a small collection of the Museum of Tervuren, and revised *Danuriae*, *Pseudoarpax* and other genera from the Congo. As to Orthoptera he published a work on a little collection fom Zannone, some minor papers, but chiefly the admirable revision of Apennine *Cophopodisma*, detecting the presence of four species (three of which new) in the area between Reatini and the Matese mountains. This work was fundamental for Italian zoogeography. Still in 1954 La Greca was one of the supporters of the foundation of the "Gruppo Italiano Biogeografi", which will be officially

instituted in 1955 with the acronym G.I.B. during the U.Z.I. meeting in Padua, in marked contrast to G.E.I., "Gruppo Embriologico Italiano". This encouraged him to deal with general problems in the field of biogeography. But, still in 1954, he also produced his *opus magnum* of more than 80 pages on the old subject of "Reduction and disappearance of the wings in Pterygota". In this work he treasured up ten years of original activity elaborating a huge synthesis become very well-known.

We are now in 1955. This year is very important for La Greca who published eight works. Two of them dealt with the African Mantodea collected by the Basilewsky expedition in Ruanda-Urundi. This allowed him to double the number of known species for the area, both with the description of a new species and with that of *Sphodromantis* of the Congo kept in the Museum of Tervuren, where he identified three new species making use, for the first time in Mantodea, of the male copulatory apparatus. In the same year he dealt again with this subject publishing a huge work of comparative morphology on the whole order, laying the basis for a new approach to the group taxonomy. He also introduced biometry in the taxonomy of Italian *Chorthippus* and completed an excellent histological research on the development of the ovarian follicle in *Dolichopoda*. Then he published some interesting observations on insular biogeography made during his own Orthoptera collectings on the Tremiti islands and on Pianosa, drawing interesting general conclusions for Italian biogeography.

Still in 1955 he gave an outstandig lecture on "Influence of Quaternary climatic variations on high altitude populations of Insects", in which he illustrated the distinctive factors of populating and speciation in the Apennine insect fauna. This work was considered a landmark in the history of international biogeography and thus, in the same year, he took part in a further University competitive exam with good chances of winning it. Sassari had a vacant chair of Zoology and La Greca was strongly supported by all the Italian zoologists. The members of the commission were Carlo Jucci, Giuseppe Scortecci, Giulio Cotronei, Pasquale Pasquini and Alberto Stefanelli. The first two were naturalists in favour of La Greca. The other three, illustrious names in Italian biology, had never dealt with systematics, comparative morphology, or biogeography. Unfortunately La Greca did not succeed and was bitterly disappointed.

In order to demonstrate how much he cared about his career and what the climate of zoology was, we report some excerpts from letters, all written in 1955. In June of this year he writes: "Tomorrow is the day when the destiny of the candidates to the chair of Zoology will be decided. In these two weeks I have worked hard (not from a scientific point of view, this kind of activity is no longer useful in competitive examinations!) and I have succeeded, thanks to the help of Professor Salfi, Professor Grandi and De Lerma, to improve my chances. I am certain that you too have heard about this, because of the tremendous outcry caused among the would-be zoologists of the opposing group by the news that some poor 'plague-spreaders' could obstruct and oppose the directions given by those who think they are the guardians of Italian zoology ".

Working rescued him from his dejection. In 1956 he retorted to Marcuzzi, who had misunderstood his work on the origin of Podisminae, published works on Polyspilotae (Mantodea) of the Belgian Congo (two new species), and the Orthoptera collected in North Africa by Giorgio Fiori and Egidio Mellini (two new taxa). Moreover La Gre-

ca studied the cuticle of Insects using the electron microscope, detecting in the cuticle chitin 40-50 mm long fibrils. As a specimen he took into consideration a scale insect, having a very thin cuticle specially permeable to the electron ray.

Still in 1956 he proposed a biogeographical explanation for the disjunct distributions of Italian Orthoptera living on the plain. He started writing, together with Cesare Sacchi, a monography of about 200 pages on the biogeography of the minor Mediterranean Islands, which was read at the II Meeting of G.I.B. in 1957. The work turned out to be one more landmark in Italian Biogeography, as the authors succeeded in integrating their own original data into previous literature, deducing the insular characteristics of various faunas, inserting their biogeographical conclusions in the historical and ecological context of the time. In 1957 too he published a huge work on the origin of the Sicilian fauna.

In 1958 La Greca devoted himself to electron microscopy investigations, describing cuticle microstructures in *Pseudococcus citri*. Coming back to his old interests, he wrote an effective treatise linking the immigration and differentiation of high altitude Apennine fauna to the paleoclimatic sequence of Europe. He produced also a fundamental monography on the Orthoptera of Apulia, based on two collecting expeditions in 1956 and 1957. The investigation had been promoted by Umberto D'Ancona, and the results were published in 1959 in the IV volume of "Memorie di Biogeografia Adriatica". La Greca listed his own findings (79 forms of Orthopera) in a work of about 140 pages, in which he reviewed the systematics of critical groups, described five new taxa, and analysed all possible populating fluxes together with the locating and dating of the old faunas of Orthoptera. It was a major summary work but at the same time it displayed an enormous amount of original research. It was certainly one of the best works of Italian biogeography ever published.

In 1959 La Greca became in the end full professor and the University of Catania rushed to appoint him. He never moved from Catania. Although he was forty-five years old and full of scars, he was extremely youthful, enthusiastic and full of imagination and confidence in himself. He was fond of cartoons, the world of Walt Disney and science fiction. Talking about his crickets and his grasshoppers he used to say: "The world of Orthoptera".

Now he wished to create a school. When he arrived in Catania taking with himself all his topics of research, his books and materials, he had no disciples, so he employed all the local staff (a rather exceptional fact at that time), throwing himself into research. The first work of this period in Catania was published in 1960 in the periodical of the Accademia Gioenia. The work was the revision of two genera of Mantodea from the Congo, based on material loaned him by the Museum of Tervuren. Moreover, also in 1960, he published an interesting comparative paper on the ultrastructure of the cuticle in several insects. He had improved his technique and he showed beautiful images of fibroid structures in peritrophic membranes. In 1961 too he continued studying ultrastructures, shifting to sensilla, microtrichia, scales and other cuticolar thickenings.

The transfer to Catania and the loss of contact with the Stazione Zoologica of Napoli marked the end of his research on Polychaeta, the only theme he ever left during his long scientifical career. He had always worked opening new ways, without abandoning the old ones. Still in 1961, carrying on with his biogeographical interests, he elaborated

a huge study on the origin and structure of the Sicilian fauna, with an excellent exposition of the relevant contemporary geological knowledge. It was the inaugural lecture of the VII Congress of the Gruppo Italiano Biogeografi. At the same time La Greca demonstrated a racial differentiation in Apulian *Troglophilus*, describing a new race from the Salento peninsula, while in 1962 he described a new species of *Dociostaurus*, palaeoendemic of Sicily. Moreover, during the VIII Congress of G.I.B. he elaborated a classification of the types of distribution of the elements of Italian fauna. This classification derived from the discussions of a group of zoologists who used to meet at the Museo Civico di Storia Naturale of Verona, which in the meantime had become the standard-bearer for research on the Apennine fauna. In the bosom of the Accademia Nazionale di Entomologia he illustrated an excellent work on the origin and evolution of insects, taking into consideration palaeontological data and metamorphosis features.

In the following years he carried on with the study of Italian Orthoptera. In 1964 he reviewed *Tropidopola* and Ephippigeridae of Sicily (1 new species and 1 new race), improved the definitions of some interesting peninsular chorologies (1965) and dealt with well known topics in some large summary works: the origin of the high altitude Apennine Orthoptera (1966) and the origin of the faunistical populating of Apulia (1967). He came back to his Mantodea, describing two Australian species (1966), revising *Sphodromantis* of West (1967: 2 new species) and North (1967: 1 new species and 1 new race) Africa.

In 1968 La Greca was appointed President of U.Z.I. and, during the XXXVII Congress of this association, he gave a speech on the palaeogenetical and neogenetical structures which occur in animal phylogenesis. In 1969 he further reviewed Italian *Cophopodisma* (two more new species and two new subspecies), described some Australian and Philippine Mantodea and some Tripolitanian Orthoptera (1 new species). He examined once more African *Sphodromantis* describing an additional new species.

After the commemoration of his predecessor in Catania, Bruno Monterosso (1966), in 1970 La Greca commemorated his old director Mario Salfi, who died unexpectedly as a consequence of the anxiety caused in him by the 1968 protest movement. In these years he devoted himself for the first time to a new activity: he published some popularizing works such as several entries of zoological taxonomy for the Enciclopedia De Agostini, "La Montagna: Fauna" (Mountain fauna), "Le Faune insulari" (Insular fauna) and "La biogeografia terrestre" (Terrestrial biogeography) for the Enciclopedia della Natura (1969-1973). Also ten years later he will write good taxonomical entries for the Enciclopedia degli animali, Mondadori (1982). He was invited by the Societé Biogeographique Française to give a talk on "Le peuplement animal terrestre de l'Afrique".

By now he had formed a strong group of assistants in Catania who slowly specialize in various orders of Orthopteroidea, previously studied all by himself. He works his utmost. This was perhaps the most productive period in his life: he prepared a treatise, Zoologia degli Invertebrati (UTET, 1977) based on strictly evolutionary principles. But he did not interrupt his research: he described a new *Omocestus* from Lampedusa, a new *Rhacocleis* from Greece (1977), and a new *Yersinella* from the Apennines. And finally he undertook a new line of studies to which he will commit himself for the rest of his life: environment protection.

In 1974 La Greca presented a new model of socio- economical development at the IV National Congress on the Preservation of Nature. Between 1975 and 1976 he never left his new commitment; in the same years he described two new *Oropodisma*, a new *Parnassiana* and a new *Chorthippus* collected in Greece by himself together with some members of the Institute of Catania. Still in 1976 he discussed about "Ecologia e gestione del Territorio" (Ecology and management of environment) at the Accademia Gioenia. As he spoke in a refined and aggressive manner, he was more and more frequently invited to Congresses. In 1976, at the XI National Congress of Entomology in Portici, he spoke about "Revaluation of Systematics", in 1977, at the U.Z.I. Congress, he offered a synthesis of his old and new ideas on the evolution of high altitude insects, and, in the same year he spoke on "Natural Parks and environmental management" with special reference to Mount Etna. Meanwhile he created a new genus of Indian Mantodea: *Rivetinula*. In 1979 he publishes, together with his disciple Angelo Messina, a survey of Greek high mountain Orthoptera in "Acrida" and "Biologia gallo-hellenica"; in the same year he described a new *Pterolepis* of Sicily in the periodical "Animalia", founded and directed by himself in Catania.

We have now reached the last twenty years of La Greca's career, during which he pursued the main activities of the previous seventy, concentrating his energies more and more on environment protection, which he tackled with fighting spirit and effective eloquency, coming into conflict with the local Government of Sicily and, generally speaking, with the Italian Government. As during his whole life, he was a faithful Communist, but La Greca's Communism was purely theoretical, detached and sentimental; as a born professor, he was on familiar terms only with very few chosen people. The period after his 65th birthday was extremely productive, yielding more than 140 works.

We may start with his most recent concern, that was environment protection. His starting point was the law which created the regional Park of Etna, whose defence made La Greca start a relentless struggle against "villettari" (as he used to call the unauthorized building of small cottages), builders of streets and tourist facilities, deforesters and all the inhabitants who thought of the Park as a source of wealth. His voice thundered everywhere: at the C.A.I., A.R.C.I., Ente Fauna Siciliana, in his own magazine "Animalia", the "Collana verde" of the Corps of Forest Rangers, at the LegAmbiente in Syracuse, in the magazines "Ambiente, Risorse e Salute", "Biogeografia" of the S.I.B., "Rassegna della Provincia Regionale di Catania", "Territorio Etna", "Natura e Montagna", "Scienza e Governo", at the S.I.T.E., the Accademia Gioenia, in "I Siciliani", "Quaderni Servizio Studi Legislativi" of Palermo, "Grifone" and many others.

For three years he was member of the "Commissione consultiva per la fauna", constituted at the Ministry for the Environment with the aim of preparing a law for the protection of the Italian fauna. This commission was formed by almost all the best known faunistic authorities in Italy, but the sagacious suggestions of La Greca were crucial for the making of the text, which represented the most considerable contribution to the main concepts regarding the Italian fauna and its management. Unfortunately this excellent draft of law, presented and discussed in a famous meeting at the Accademia dei Lincei, has been left a draft up to now and the possibilities that it will be taken into consideration in the future are very few.

We pass now to survey his production in his traditional fields of interests.

His interest in the systematics of Orthoptera was his favourite taxonomical subject also in the last twenty years of his life: La Greca published a masterly synthesis, rich in original data too, on the Orthoptera of high altitude pastures in the Central Apennines (1982); he reviews, together with his disciple F. Lombardo, the Mediterranean-Asian species of *Rivetina* with the description of three new species and five subspecies; he published a synthesis of the Orthopera and Mantodea of Sardinia, considered also from a zoogeographical point of view (1983); he describes, with F. Lombardo, two new species of *Pareuthyphlebs* from Arabia and revised the Orthoptera of the western Piedmontese Alps, describing a new *Stenobothrus* (1985); he described also, with F. Lombardo, a new Somalian *Neodanuria* (1986) and revised *Sphodromantis* of Eastern Africa (1987); he described some new features of pronotum in Acridoidea (1987) and, still with F. Lombardo, he described four new species of African *Chrysomantis* (1987), two new Neotropical Mantodea (1989), a revision of *Acanthophilus* of Namibia (1989), five species of Mantodea of Sudan, one of which new (1993) and in the end a new species of the genus *Theopompella* of Zaire and Nigeria (1993). Among the Orthoptera he described a series of Senegalese Acridoidea with a new species (1993), and the previously unknown male of an *Antaxius* living on the High Atlas (1993), eight new species of Moroccan Pamphagidae, for which two new genera are created (1993). He described also a new tribe with a new genus for a new species of Acridoidea of the Ethiopian Highlands (1994) as well as a series of data on some critical Italian species (1994). He finally published additional extensive works, in which the current biogeographical ideas on the origin of the Orthoptera of the Italian fauna are summarized (1982, 1995, 1996). These ideas were mostly the result of the collecting activity and the studies of La Greca himself and of his pupils. At the XX International Congress of Entomology in Florence he presented a fundamental paper on the Biogeography of Palaeartic Pamphagidae (1997). In the same year he contributed to an excellent research on the Orthoptera of the Peligna Valley, published with F. Lombardo a new Mantodea from Bolivia and commemorated his old friend De Lerma at the Italian National Academy of Entomology.

In these twenty years La Greca intervened more and more on the origins of particular groups of animals or particular faunas. He gave a talk on the origin of Arthropoda at the Accademia dei Lincei (1981), but above all, as his whole biogeographical activity points out, we find him discussing about the biogeographical aspects of insularity in the western Mediterrenean (1990), about the origin of the fauna of Eastern Africa (1990), the Antarctic fauna (1991), the Italian fauna (1954, 1984), the fauna of Iblei Mts (Sicily) (1995) and about the biogeographical aspects of the plate tectonics (1989-1990). In the meantime, after an adjustment of the use of the comparison of the data coming from various branches of biogeography, he summarized his multidisciplinary concept of biogeography in collaboration with his collaborator A. Messina (1986, 1995). He insisted on the need of using a correct nomenclature in Zoology (1995), on the value of subgenera and subspecies in modern zoogeography (1987) and weighed the role of taxonomy in zoology (1983). But above all, he writes, in collaboration with A. Messina, a fundamental work on the populating dynamism in the mountain environments of Greece (1979).

La Greca was a convinced systematist: taking into account Polychaeta, Mantodea and Orthoptera he described 102 species or subspecies new for science, 6 between genera and tribes. He could not miss the chance to make his contribution also to museology. Since his arrival in Catania he had suffered seeing the conditions of the so called museum of his Institute. In the end he had succeeded in reviving, enriching and arranging it in an acceptable way. He had contributed some papers to the subject (1992, 1998), starting from a critical attitude towards University museums and ending up by wishing the creation of several regional Museums, one of them in Sicily (1995). We really hope that this desperate demand of his may be granted soon, together with his environmental concerns. The two sides of the same coin. Following his disappointment about zoological museums in universities, he came to the wise decision to transfer his huge collection of Mantodea and Orthoptera, rich in types, together with his up-to-date library, to the Museo Civico di Storia Naturale in Milan, whose glorious systematic tradition guaranteed the survival of this irreplaceable collection.

As an enthusiastic speleologist he began exploring subterranean environments during his stay in Naples. In Sicily he relied on potholers, and in 1990 he opened the first Regional Meeting of Sicilian Speleology with a lecture on "Speleological Sciences Yesterday and Today". Another field in which he was very successful was scientific divulgation which he practised mainly at the Accademia Gioenia, of which he was president. Two of his lectures given at the Accademia Goenia are particularly noteworthy: "The Origin and Evolution of Man" (1983) and "Zoology Yesterday and Today" (1991).

Not even in the very last years of his life did his activity slow down. In 1998 he continued collaborating with the periodical "Grifone", attended the XVIII National Congress of Entomology giving a lecture on "Systematics and biogeography of insects" and published a paper on the palaeoclimatic situation in the Quaternary era in the Proceedings of the XXXI Congress of the Italian Society of Biogeography, in addition to the Conclusions of the meeting. But that is not all: he delivered a speech on the conservation of Sicilian fauna at the Accademia Gioenia, and together with Paolo Fontana published the descriptions of a new Apenninic genus of Acrididae (*Italohippus*) and a new species of *Chorthippus* from Calabria. In 2000 he published an essay on the conservation of terrestrial Invertebrates in the Proceedings of the Accademia dei Lincei, the text of the lecture on the biogeography of Anatolian Orthoptera he had given at the XXXII Congress of the S.I.B. held in Rome in 1998, and described new taxa of Sicilian *Glyptobothrus* in the Bollettino of the Accademia Gioenia. Still in the year 2000 he attended the XXXIII Congress of the S. I. B. in Palermo, and succeeded in handing in the text of the lecture he had delivered. He continued loving life and hence his work.

In the year 2000, when his condition was serious due to a car crash which forced him to stay either in bed or in an armchair, he was asked to write some chapters (Fauna and environmente, Fauna of sandy shores, The origins of the Italian fauna) of the book "The Italian fauna" which will be the remake, promoted by the Ministry for Environment jointly with Touring Club Italiano, of a similar text published in 1959 in the T. C. I. serie "Conosci l'Italia" (Know Italy). This well known book, very popular with two generations of Italian zoologists, was mostly outdated due to half a century of research in the fields of faunistics and biogeography. In this volume, which by unanimous

decision of the editorial board will be dedicated to the memory of Marcello La Greca, he will have the opportunity to summarize the present knowledge regarding the origins of the Italian fauna, a subject to which he greatly contributed. His unbowed will to stay active up to the very end is shown by the fact that in the morning of the very day he died (February 10th, 2001), he discussed on the phone with Alessandro Minelli some editorial details.

This eighty seven year old man, maybe the most important Italian zoologist of the 20th century, ended his life in the arms of his wife saying: "I feel I am going away…"; thus he left all he had always looked for, striven after and in the end obtained: the love of a woman who could understand him, the spell of his work and the warmth of his friends.

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Filippo Maria BUZZETTI

List of the species described by Prof. Marcello La Greca and his bibliography

Abstract - The list of the 286 publications of Marcello La Greca and the list of the taxa by him described are given. Publications are also divided by taxon, geographical area and the argument treated

Riassunto - *Lista delle specie descritte dal Prof. Marcello La Grēća e sua bibliografia.*
Vengono qui riportati la lista delle 290 pubblicazioni di Marcello La Greca e l'elenco delle specie da Lui descritte. Le pubblicazioni sono inoltre divise per taxon, area geografica ed argomento trattati.

Key words: Marcello La Greca, publications, species described, taxon, biogeographical area, argument.

During His fruitful and successful career, Prof. Marcello La Greca published a huge amount of scientific articles, entries and newspaper articles on many subjects of zoology, from Anellida to Mammalia, from systematic to biogeography. He wrote not only for scientists, but also popularized many aspects of biology, publishing on scientific journals, as well as in popular periodicals and newspapers. Furthermore, it should be mentioned the many congresses and conferences which he attended.

His last work was the contribution to the book of T.C.I. on Italian fauna and he was so adsorbed in this that last morning of His life, few hours before his death, he contacted by phone Alessandro Minelli to arrange some details of the book.

Finally, when Paolo Fontana went to home of Prof. La Greca some days after his death to put in order the work of his guide, found out that He was working on a popular book on life history and on some new and interesting Acridomorpha from Afghanistan, the latter of those published in the present volume.

These circumstances are revealing of how much Marcello La Greca was involved in his work of scientist and loved the divulgation of scientific subjects.

The list of the pubblications of Prof. Marcello La Greca is here chronologically arranged, and then by taxon, biogeographical area and argument. The rank "general" assembles all the publications not strictly scientific or treating wide arguments (*i.e.* legislation of natural parks or general biology). Taxa described are listed following the order reported in the volumes of the series "Checklist delle specie della fauna italiana". The same publication numbering is used in the list of the described taxa and in the grouping by taxon, biogeographical area and argument. If not differently specified, the Author of the listed papers is M. La Greca only.

The author thanks Paolo Fontana (University of Padova) who provided photos and reprints of Prof. Marcello La Greca and Andrea Castellani (Milano) who helped in the listing.

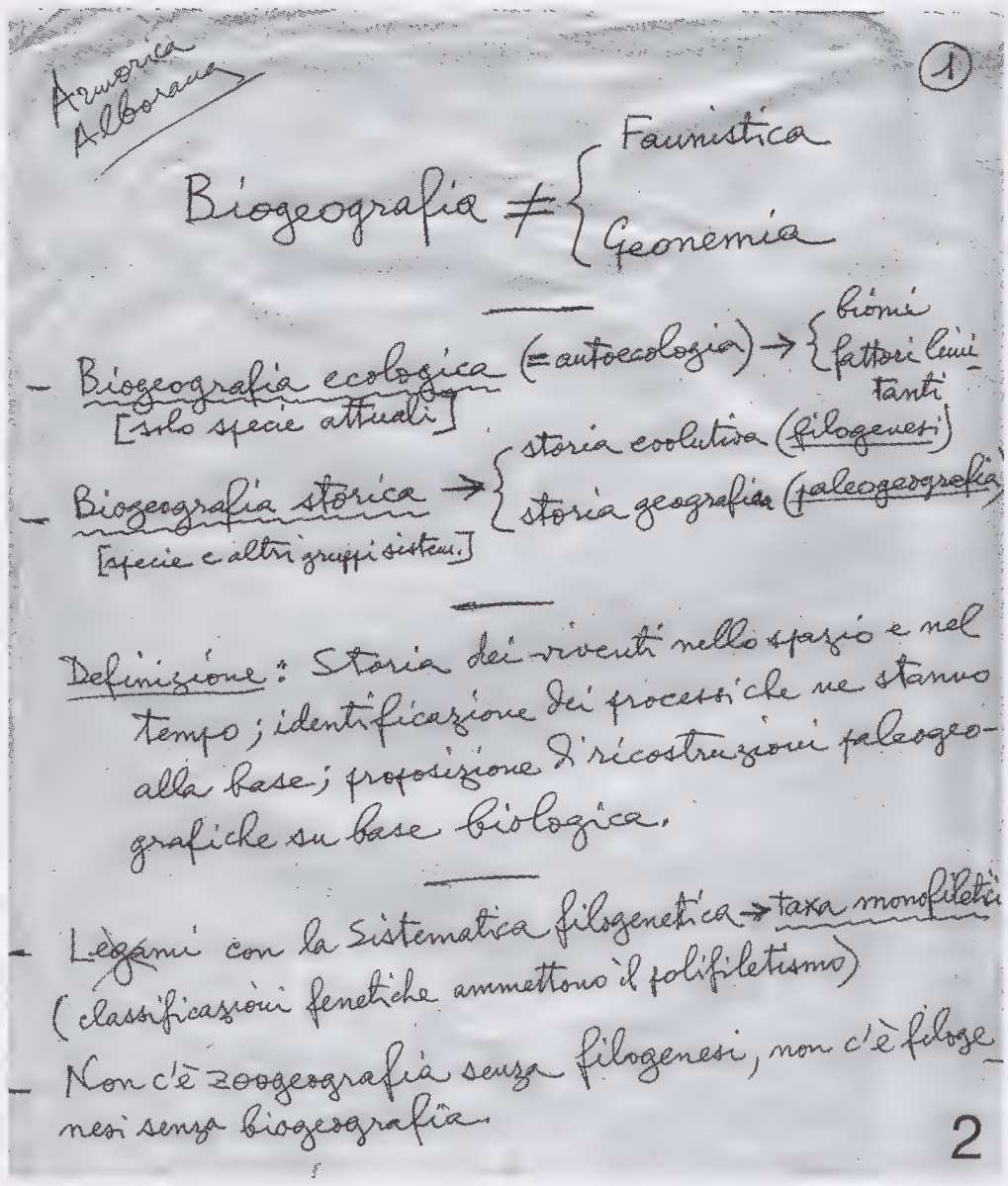
Armorica Alborana
1
Biogeografia ≠ { Faunistica / Geonemia
– Biogeografia ecologica [solo specie attuali] (= autoecologia) → { biomi / fattori limitanti
– Biogeografia storica [specie e altri gruppi sistem.] → { storia evolutiva (filogenesi) / storia geografica (paleogeografia)
Definizione: Storia dei viventi nello spazio e nel tempo; identificazione dei processi che ne stanno alla base; proposizione di ricostruzioni paleogeografiche su base biologica.
– Legami con la Sistematica filogenetica → taxa monofiletici (classificazioni fenetiche ammettono il polifiletismo)
– Non c'è zoogeografia senza filogenesi, non c'è filogenesi senza biogeografia.
2

Fig. 1 - Marcello La Greca.
Fig. 2 - Handwritten notes on biogeography by Marcello La Greca.

LIST OF PUBBLICATIONS OF PROF. MARCELLO LA GRECA

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286 - 2002. Fauna e ambiente. In: La fauna in Italia (a cura di A. Minelli, C. Chemini, R. Argano, S. Ruffo), Touring Editore, Milano e Ministero dell'Ambiente e della Tutela del Territorio, Roma: 10-16.

287 - 2002. Gli ambienti delle coste marine. In: La fauna in Italia (a cura di A. Minelli, C. Chemini, R. Argano, S. Ruffo), Touring Editore, Milano e Ministero dell'Ambiente e della Tutela del Territorio, Roma: 230-241.

288 - 2002. Vicende paleogeografiche e componenti della fauna italiana. In: La fauna in Italia (a cura di A. Minelli, C. Chemini, R. Argano, S. Ruffo), Touring Editore, Milano e Ministero dell'Ambiente e della Tutela del Territorio, Roma: 360-376.

289 - 2004. Two new species of Acridomorpha from Afghanistan with description of a new genus (Insecta, Orthoptera). Mem. Soc. entomol. ital., 82(2) (2003): 503-510.

290 - in press. (FONTANA P., LA GRECA M., KLEUKERS R.). Ortotteri. In: Ruffo S., Stoch F. (eds), Distribuzione delle specie della fauna italiana. Ministero dell'Ambiente e della Tutela del Territorio - Direzione Conservazione Natura, Comitato Scientifico per la Fauna d'Italia, Museo Civico di Storia Naturale di Verona.

Tab. 1 - Publications of Marcello La Greca, grouped by taxon, geographical area and argument.

Argument	Geographical area	Taxon	List of the publications
		Polycheta	12, 15, 16, 26, 30, 37, 42, 44, 45, 46
		Chilopoda	56
		Blattaria	55, 61, 69, 80, 96, 119, 267
		Mantodea	2, 3, 4, 5, 6, 7, 8, 28, 29, 32, 33, 35, 41, 49, 50, 51, 54, 58, 59, 61, 62, 64, 66, 68, 69, 75, 81, 96, 99, 101, 103, 104, 119, 120, 121, 149, 174, 176, 177, 186, 191, 197, 198, 208, 238, 246, 265, 267
		Ensifera	1, 2, 10, 22, 24, 35, 39, 40, 43, 54, 55, 60, 61, 69, 75, 78, 81, 89, 92, 96, 97, 98, 106, 119, 134, 135, 139, 143, 155, 156, 158, 162, 163, 173, 176, 183, 184, 207, 243, 245, 251, 259, 261, 267, 279, 290
		Caelifera	10, 19, 20, 21, 22, 23, 24, 35, 36, 39, 40, 52, 54, 55, 57, 61, 63, 65, 68, 69, 75, 81, 85, 89, 95-98, 106, 119, 124, 132, 138, 139, 141, 151, 155, 158, 162, 163, 173, 176, 183, 184, 192, 193, 216, 222, 232, 236, 238, 243, 244, 251, 259, 260, 267, 275, 277-279, 284, 289, 290
		Phasmatodea	55, 61, 267
		Dermaptera	55, 22, 39, 61, 267
		Heteroptera	27, 38
		Homoptera	67, 72, 74

	Diptera	13
	Mammalia	271
Ethiopic		2, 4, 5, 8, 32, 33, 41, 49, 51, 58, 59, 64, 66, 69, 75, 81, 99, 103, 104, 119, 120, 125, 153, 177, 186, 191, 198, 207, 215, 216, 222, 244-246
Australia		101
India		122, 149, 203
Neotropics		3, 6, 7, 208, 265
Antarctica		216
Palearctic		26, 37, 65, 70, 81, 95, 135, 138, 141, 143, 155, 158, 174, 177, 196, 213, 232, 260, 275, 279, 289
Italy		13, 16, 19, 22, 23, 24, 35, 40, 43, 52, 54, 55, 57, 61, 68, 71, 75, 79, 81, 84, 85, 87, 89, 90, 92, 94-98, 106, 124, 126, 132, 134, 139, 142, 147, 148, 156, 162, 163, 170, 173, 176, 178, 179, 182, 183, 184, 189, 195, 199, 216, 236, 243, 251, 259, 267, 276-278, 284-288, 290
muscles		1, 28, 29
brachypterism		9, 11, 27, 53, 88
teratology		10
speleology		14
functional morphology		17, 18, 20, 193
nerves - flight		21, 161, 172
morphology		28, 29, 30, 31, 36, 38, 67, 72, 74, 77, 80, 82, 192, 193
biometry		57
internal morphology		60, 62
climate		63, 73, 97, 270, 273
biogeography		65, 68, 75, 81, 87, 90, 94, 106, 125, 126, 129, 130, 140, 146, 151, 170, 178, 183, 206, 213, 215, 217, 259, 260, 266, 272, 275, 279, 288
general		71, 83, 86, 91, 102, 107, 117, 118, 121, 123, 131, 133, 136, 137, 142, 144, 145, 146, 147, 148, 150, 152, 154, 157, 159, 160, 164-169, 171, 175, 179, 180, 181, 182, 185, 187, 188, 189, 190, 194-196, 199-205, 210-212, 214, 215, 218-221, 223-231, 234-235, 237, 239-242, 247-250, 252-258, 261-264, 266, 272, 274, 276, 280-283, 285-287
review		105, 268
Encyclopedia		109-116
in memoriam		100, 127, 128, 269
bioacoustics		278

Tab. 2 - List of taxa described by Marcello La Greca.

Order	taxon	publication
(numbers listed refer to list of publications given above)		
Polichaeta		
	Ophryotrocha labronica	84
	Eulalia (Phyllotethys) kosswigi	26
Mantodea		
	Miomantis ciprianii	8
	gen. *Paradanuria*	50
	Panurgica rehni	51
	Panurgica basilewskyi	51
	Pseudoharpax virescens centralis	51
	Pseudoharpax dubius	51
	Pseudoharpax crenaticollis	51
	Pseudoharpax parallelus	51
	gen. *Congoharpax*	51
	Congoharpax aberrans	51
	Galepsus (Onychogalepsus) fallax	58
	Sphodromantis (Sphodromantis) pavonina	59
	Sphodromantis (Sphodromantis) hyalina	59
	Sphodromantis (Rhomboderella) parmata	59
	Galepsus (Lygdamia) scorteccii	64
	Polyspilota pavani	99
	Hierodula inexpectata	99
	Calofulcinia australis	101
	Sphodromantis elongata	120
	Calofulcinia oxynota	122
	Bolbe lowi	122
	gen. *Rivetinula*	149
	Phaeophilacris chopardi	153
	Phaeophilacris macroxipha	153
	Phaeophilacris parva	153
	Rivetina baltica tenuidentata	174
	Rivetina syriaca anatolica	174
	Rivetina syriaca mesopotamica	174
	Rivetina byblica	174
	Rivetina inermis iranica	174
	Rivetina rhombicollis	174
	Rivetina laticollis	174
	Pareuthyphlebs arabica	177
	Pareuthyphlebs scorteccii	177
	Sphodromantis viridis simplex	191
	Sphodromantis pardii	191
	Sphodromantis baccettii	191
	Sphodromantis pachinota	191
	Sphodromantis giubana	191
	Sphodromantis aethiopica	191

Sphodromantis citernii kenyana 191
Sphodromantis lineola speciosa 191
gen. *Lobothespis* 197
Lobothespis vignai 197
Chrysomantis congica 198
Chrysomantis royi 198
Chrysomantis centralis 198
Chrisomantis cervoides 198
Mantoida argentinae 208
Mantoida ronderosi 208
Theopompella elegans 246
Pseudoacanthops lobipes 265

Orthoptera

Chorthippus albicornis 22
Chorthippus mollis salfii 23
Metaplastes ippolitoi 24
Rhacocleis thyrrhenica 43
Cophopodisma costai ebneri 52
Cophopodisma samnitica samnitica 52
Cophopodisma samnitica fiscellana 52
Sphingonotus vitreus brevipes 69
Helioscirtus grandii 69
Rhacocleis japygia 75
Eupholidoptera hesperica 75
Eupholidoptera danconai 75
Eupholidoptera garganica 75
Ephippiger apulus italicus 75
Troglophilus andreinii hydruntinus 78
Dociostaurus minutus 85
Tropidopola graeca transjonica 95
Eremogryllodes fiorii 119
Cophopodisma baccettii 124
Cophopodisma trapezoidalis 124
Cophopodisma t. trapezoidalis 124
Cophopodisma t. aprutiana 124
Cophopodisma t. curvala 124
Cophopodisma acuminata 124
Cophopodisma a. acuminata 124
Cophopodisma a. marsicana 124
Omocestus lopadusae 132
Yersinella beybienkoi 134
Rhacocleis trilobata 135
Chorthippus lacustris 138
Oropodisma karavica 141
Oropodisma willemsei 141
Parnassiana gionica 143
Phaeophilacris chopardi 153
Phaeophilacris macroxipha 153

Phaeophilacris parva 153
Pterolepis siciliensis 156
Stenobothrus nadigi 184
Acrotylus gracilis 216
Trilophidia namibica 222
Euryparyphes défauti 232
Euryparyphes tazzekensis 232
Euryparyphes paraflexuosus 232
Euryparyphes atlasicus 232
Euryparyphes nigripes 232
Euryparyphes breviphallus 232
Euryparyphes cinerascens 232
Paraeumigus nadigi 232
Paraeumigus bolivari 232
gen. *Paraeuryparyphes* 232
gen. *Nadigeumigus* 232
Nadigeumigus mirabilis 232
Afroxyrrhepes luteipes 238
gen. *Aethiopiacris* 244
Aethiopiacris parva 244
gen. *Italohippus* 277
Chorthippus bruttius 278
Glyptobothrus brunneus raggei 284
Glyptobothrus messinai 284
Glyptobothrus trinacriae 284
gen. *Cryptonothrotes* 289
Cryptonothrotes pseudoapterus 289
Iranella simonettai 289

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Andrea CASTELLANI

A catalogue of the types in La Greca's collection of orthopteroid insects, with several lectotype designations (Mantodea, Orthoptera)

Abstract - The author provides a critical and annotated catalogue of the 775 type specimens preserved in M. La Greca's collection, belonging to 109 species and subspecies of Mantodea and Orthoptera. He also designates the lectotypes for the following 12 taxa: *Rivetina baetica* ssp. *tenuidentata* La Greca & Lombardo, 1983; *Ephippiger apulus* ssp. *italicus* La Greca, 1959; *Bolivarius brevicollis* ssp. *trinacriae* (La Greca, 1964); *Uromenus riggioi* La Greca, 1964; *Troglophilus andreinii* ssp. *hydruntinus* La Greca, 1961; *Italopodisma acuminata* ssp. *marsicana* (La Greca, 1969); *Italopodisma samnitica* (La Greca, 1954); *Italopodisma trapezoidalis* ssp. *aprutiana* (La Greca, 1969); *Italopodisma trapezoidalis* ssp. *curvula* (La Greca, 1969); *Tropidopola graeca* ssp. *transjonica* La Greca, 1964; *Dociostaurus minutus* La Greca, 1962; *Dirshius lopadusae* (La Greca, 1973).

Riassunto - *Catalogo dei tipi della collezione La Greca di insetti Ortotteroidei, con designazione di alcuni lectotipi (Mantodea, Ortoptera).*
L'autore fornisce un catalogo critico e annotato dei 775 esemplari tipici conservati nella collezione di M. La Greca, appartenenti a 109 specie e sottospecie di Mantodea e di Orthoptera. Inoltre designa i lectotipi dei seguenti 12 taxa: *Rivetina baetica* ssp. *tenuidentata* La Greca & Lombardo, 1983; *Ephippiger apulus* ssp. *italicus* La Greca, 1959; *Bolivarius brevicollis* ssp. *trinacriae* (La Greca, 1964); *Uromenus riggioi* La Greca, 1964; *Troglophilus andreinii* ssp. *hydruntinus* La Greca, 1961; *Italopodisma acuminata* ssp. *marsicana* (La Greca, 1969); *Italopodisma samnitica* (La Greca, 1954); *Italopodisma trapezoidalis* ssp. *aprutiana* (La Greca, 1969); *Italopodisma trapezoidalis* ssp. *curvula* (La Greca, 1969); *Tropidopola graeca* ssp. *transjonica* La Greca, 1964; *Dociostaurus minutus* La Greca, 1962; *Dirshius lopadusae* (La Greca, 1973).

Key words: taxonomy, types catalogue, lectotypes designation.

INTRODUCTION

Before his decease, occurred on 10 February 2001 (Fontana 2002), Prof. Marcello La Greca decided to sell his extraordinary entomological collection, and his whole library about orthopteroid insects, to the Museo Civico di Storia Naturale di Milano. In summer 2001, the museum moved the collection and the library from Catania to Milan. Later on, I began to reorder and to study the collection of the renowned Sicilian orthopterist, and I soon realized the need to prepare a catalogue of its abundant type material.

La Greca's collection consists of some 35,000 specimens (193 Blattaria, 1,909 Mantodea, more than 30,000 Orthoptera, 163 Phasmatodea and 1,349 Dermaptera), including 775 type specimens belonging to 109 species and subspecies. Among these, 91 types belong to 38 species and subspecies of Mantodea, 171 types belong to 21 species and subspecies of Ensifera, and 513 types belong to 50 species and subspecies of Caelifera.

The collection is stored in 706 entomological boxes (511 "standard" boxes measuring 39 x 26 x 6 cm, and 195 smaller ones measuring 26 x 19.5 x 6 cm), which I catalogued and rearranged in 7 cabinets, each capable of holding 100 "standard" boxes. Then I looked for all the specimens labelled as types, and I recorded their data in a database, on the basis of which I compiled this catalogue.

Comparing my database with the original descriptions, I noticed some cases where specimens labelled as types did not correspond to the type specimens designated in the original descriptions. In several other cases, specimens labelled as holotypes, allotypes and paratypes were actually syntypes, according to the original descriptions. These and other inaccuracies are quite common in La Greca's collection, but they may be understandable when considering that La Greca used to work as a taxonomist mostly for the sake of his biogeographical studies. Thus, because of his shortage of time, sometimes he lacked the necessary precision in managing his collection.

To correct La Greca's inaccuracies, I excluded 176 specimens uncorrectly labelled as types, and I added 186 specimens, not labelled as types, but that I recognized as types on the basis of the original descriptions. Also, I changed the status of 171 type specimens, in most cases to syntypes.

Finally, I designated the lectotypes for the 4 species and 8 subspecies whose complete (or almost complete) syntype series are preserved in La Greca's collection. These designations changed 12 syntypes into lectotypes, and 320 syntypes into paralectotypes.

SYNOPSIS

Marcello La Greca's collection comprises 775 types, divided as follows:

36 holotypes (abbreviated as **HT**): 9 Mantodea and 27 Orthoptera (9 Ensifera, 18 Caelifera);
12 lectotypes (abbreviated as **LT**): 1 Mantodea and 11 Orthoptera (4 Ensifera, 7 Caelifera);
1 neotype (abbreviated as NT): 1 Orthoptera (Ensifera);
24 syntypes (abbreviated as ST): 23 Mantodea and 1 Orthoptera (Caelifera);
26 allotypes[1] (abbreviated as AT): 4 Mantodea and 22 Orthoptera (8 Ensifera, 14 Caelifera);
356 paratypes (abbreviated as PT): 43 Mantodea and 313 Orthoptera (69 Ensifera, 244 Caelifera);
320 paralectotypes (abbreviated as PLT): 11 Mantodea and 309 Orthoptera (80 Ensifera, 229 Caelifera).

I designate the lectotypes for the following 4 species and 8 subspecies:

Rivetina baetica ssp. *tenuidentata* La Greca & Lombardo, 1983 [Mantodea Mantidae];
Ephippiger apulus ssp. *italicus* La Greca, 1959 [Ensifera Bradyporidae];

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[1] Conforming to La Greca's use, in this catalogue I consider as allotype the specimen upon which the sex opposite to the holotype's was originally described. Allotypes, however, should be considered as mere paratypes.

Bolivarius brevicollis ssp. *trinacriae* (La Greca, 1964) [Ensifera Bradyporidae];
Uromenus riggioi La Greca, 1964 [Ensifera Bradyporidae];
Troglophilus andreinii ssp. *hydruntinus* La Greca, 1961 [Ensifera, Rhaphidophoridae];
Italopodisma acuminata ssp. *marsicana* (La Greca, 1969) [Caelifera Catantopidae];
Italopodisma samnitica (La Greca, 1954) [Caelifera Catantopidae];
Italopodisma trapezoidalis ssp. *aprutiana* (La Greca, 1969) [Caelifera Catantopidae];
Italopodisma trapezoidalis ssp. *curvula* (La Greca, 1969) [Caelifera Catantopidae];
Tropidopola graeca ssp. *transjonica* La Greca, 1964 [Caelifera Catantopidae];
Dociostaurus minutus La Greca, 1962 [Caelifera Acrididae];
Dirshius lopadusae (La Greca, 1973) [Caelifera Acrididae].

Structure of the catalogue

Genera are listed according to a systematic criterion, based on Harz (1969, 1975), on Harz & Kaltenbach (1976), on Failla et al. (1994), and on Fontana et al. (2002), whereas species and subspecies are listed alphabetically within the genus.

For each taxon (species or subspecies) included in this catalogue, I provide:
the valid name[2], the author, the year of description, and the family (for Orthoptera, also the subfamily);
the original name (when different from the valid name), and the bibliographic references for the original description;
the type locality (*locus typicus*);
the data for all the types in La Greca's collection (see below);
the lectotype designation, if any;
any other notes.

For each group of name-bearing types (**HT**, **LT**, NT, and ST) with the same data set, I reported all the available information, as follows:
the number of specimens: males, females, and nymphs;
the locality, including the geographic coordinates and the elevation (in metres above sea level);
the date;
the collector's name;
the identifier's name and the date of identification;
any particular mounting of the specimens (extracted genitalia, extended wings);
any further data reported on the labels;
any information reported on labels added by me.

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[2] Conforming to La Greca (1987) and to Failla et al. (1994), in this catalogue I don't provide any subgeneric name as part of a valid name.

For each group of secondary types (AT, PT, and PLT) with the same data set, I reported:
the number of specimens: males, females, and nymphs;
the locality, including the geographic coordinates and the elevation (in metres above sea level);
any information reported on labels added by me.

MEASUREMENTS

The lectotypes' measurements have been taken by means of an electronic caliper.

For MANTODEA, the measurements are defined as follows:

BLT (body length to the tegmina): the length of the body measured from the apex of the head to the apex of the tegmina;
PL (pronotal length): the sagittal length of the pronotum;
PW (pronotal width): the maximum width of the pronotum;
FFL (fore femora length): the maximum length of the fore femora;
FFW (fore femora width): the maximum width of the fore femora.

For ORTHOPTERA, the measurements are defined as follows:

BL (body length): the length of the body measured from the apex of the head to the apex of the hind femora;
PL (pronotal length): the sagittal length of the pronotum;
HFL (hind femora length): the maximum length of the hind femora;
OL (ovipositor length): the length of the ovipositor measured ventrally.

CATALOGUE OF THE TYPES

Order MANTODEA

Caudatoscelis lagrecai (Roy, 1964) [Amorphoscelididae]

Amorphoscelis lagrecai, Bull. IFAN, 26, A, 3: 730-731.

LOC. TYP.: NIGERIA, Ibadan.

1 **HT**: ♂; loc. typ.; 2 December 1958; M. La Greca leg.; det. R. Roy 1963; a label reads "Genitalia n° 190 R. Roy".

Sibyllopsis griffinii ssp. *guineensis* (Roy, 1965) [Sibyllidae]

Sibylla griffinii ssp. *guineensis*, Bull. IFAN, 27, A, 2: 592-593.

LOC. TYP.: GUINEA, Nzérékoré.

1 PT: ♂; loc. typ.

Sibyllopsis vanderplaetseni (Roy, 1963) [Sibyllidae]

Sibylla vanderplaetseni, Mém. IFAN, 66, 5: 195-197.

LOC. TYP.: GUINEA, Nimba, Ziéla.

1 PT: ♂; loc. typ., lamp.

Oxypilus hamatus Roy, 1966 [Hymenopodidae]
Bull. IFAN, 28, A, 4: 1442-1445.
LOC. TYP.: BENIN [former Dahomey], environs of Porto Novo.
6 PT: ♂♂; NIGERIA, Ibadan.

Pseudoharpax beieri La Greca, 1950 [Hymenopodidae]
Riv. Biol. Col., 10: 96-98.
LOC. TYP.: ETHIOPIA, Sagan-Omo, Banno.
1 **HT**: ♂; loc. typ.; 2 May 1939; E. Zavattari mission leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; ETHIOPIA, Sagan-Omo, Caschei.

Pseudoharpax parallelus La Greca, 1954 [Hymenopodidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 6, 2: 34-35.
LOC. TYP.: KENYA, Uasin Gishu plateau.
1 **HT**: ♀; loc. typ., Strobele; 15 June 1944; M. La Greca leg.; det. M. La Greca.

Pseudoharpax virescens ssp. *centralis* La Greca, 1954 [Hymenopodidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 6, 2: 22-23.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Kibali-Ituri, Kasenyi.
1 PT: ♂; loc. typ.
1 PT: ♂; DEM. REP. OF THE CONGO [former Belgian Congo], Kibali-Ituri, Geti.

Chlidonoptera chopardi Roy, 1964 [Hymenopodidae]
Bull. IFAN, 26, A, 3: 764-768.
LOC. TYP.: IVORY COAST, Banco forest.
1 PT: ♂; loc. typ.

Congoharpax aberrans La Greca, 1954 [Hymenopodidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 6, 2: 38-39.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Kibali-Ituri, Mongbwalu (Kilo).
1 PT: ♂; DEM. REP. OF THE CONGO [former Belgian Congo], Tshuapa, Boende.

Panurgica rehni La Greca, 1954 [Hymenopodidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 6, 2: 6-10.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Tshuapa, Eala.
1 PT: ♂; loc. typ.
1 PT: ♂; DEM. REP. OF THE CONGO [former Belgian Congo], Tshuapa, Flandria.

Apterocorypha somalica Lombardo, 1986 [Thespidae]
Animalia, 12: 8-11.
LOC. TYP.: SOMALIA, Gesira.
1 **HT**: ♂; loc. typ.; 2 February 1984; B. Baccetti leg.; det. F. Lombardo; extracted genitalia.

Calofulcinia australis La Greca, 1966 [Iridopterygidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 17, 4: 3-7.
LOC. TYP.: AUSTRALIA, south-eastern Queensland, Samford, Upper Cedar creek.
2 PT: 1 ♂ + 1 ♀; loc. typ.

Bolbe lowi La Greca, 1969 [Iridopterygidae]
Ann. Mus. Civ. St. Nat. Genova, 77: 636-637.
LOC. TYP.: AUSTRALIA, Queensland, Yorkeys Knob (near Cairns).
1 PT: ♂; loc. typ.

Tarachodes binotatus La Greca, 1950 [Mantidae]
Riv. Biol. Col., 10: 85-86.
LOC. TYP.: ETHIOPIA, Sagan-Omo, Caschei.
1 PT: ♂; ETHIOPIA, Sagan-Omo, Banno.
1 PT: ♂; ETHIOPIA, Sagan-Omo, Asile.

Tarachodes oxynotus La Greca, 1952 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 4, 1: 6-10.
LOC. TYP.: SOMALIA [former British Somaliland], Hargeisa, 9° 33' N, 44° 3' E.
1 PT: ♂; SOMALIA [former British Somaliland], Haud, 8° 55' N, 44° 15' E, 4,000 ft [1,219 m].

Theopompella chopardi Roy, 1963 [Mantidae]
Mém. IFAN, 66, 5: 180-182.
LOC. TYP.: GUINEA, Nimba, Ziéla.
1 PT: ♂; loc. typ., U.V. lamp.

Theopompella elegans La Greca & Lombardo, 1994 [Mantidae]
Animalia, 20: 49-51.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Tshuapa, Coquilhatville.
1 **HT**: ♂; loc. typ.; 1945; Rév. P. Hulstaert leg.; det. M. La Greca & F. Lombardo; a label reads "Coll. Mus. Congo".

Pseudoyersinia lagrecai Lombardo, 1985 [Mantidae]
Animalia, 11: 23-29.
LOC. TYP.: ITALY, Sicily, Villarosa (Enna).
1 **HT**: ♂; loc. typ.; 29 September 1969; Nobile & Messina leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
6 PT: 4 ♂♂ + 2 ♀♀; loc. typ.

Oxyothespis noctivaga La Greca, 1952 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 4, 1: 22-24.
LOC. TYP.: SOMALIA [former British Somaliland], Haud, 8° 28' N, 45° 38' E, 2,500 ft [762 m].
1 PT: ♂; loc. typ.

Calamothespis taylori La Greca, 1952 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 4, 1: 40-44.
LOC. TYP.: SOMALIA [former British Somaliland], Haud, 4,000 ft [1,219 m].
1 PT: ♂; loc. typ.

Rhomboderella gabonica Roy, 1972 [Mantidae]
Biol. Gab., 3-4: 267-269.
LOC. TYP.: GABON, Bélinga.
1 PT: ♂; loc. typ.

Tismomorpha inexpectata (La Greca, 1966) [Mantidae]
Hierodula inexpectata, Fragm. Ent., 4, 7: 102-106.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Yangambi.
1 PT: ♂; loc. typ.

Prohierodula brunnea La Greca, 1956 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 8, 11: 15-18.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Tshuapa, Yolo.
1 PT: ♂; DEM. REP. OF THE CONGO [former Belgian Congo], Sankuru, Komi.

Prohierodula viridimarginata La Greca, 1956 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 8, 11: 18-20.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Uele, Ibembo.
1 PT: ♂; DEM. REP. OF THE CONGO [former Belgian Congo], Kibali-Ituri, Epini (Epulu).

Epitenodera equatoriana La Greca, 1993 [Mantidae]
Riv. Mus. Civ. Sc. Nat. Caffi Bergamo, 16: 88-90.
LOC. TYP.: SUDAN, Equatoria, Okaru.
1 PT: ♂; loc. typ.

Sphodromantis baccettii La Greca & Lombardo, 1987 [Mantidae]
Mon. Zool. Ital., 13: 219-221.
LOC. TYP.: SOMALIA, Mogadishu.
1 **HT**: ♂; loc. typ.; February 1978; Di Gerolamo leg.; det. M. La Greca; extracted genitalia.

Sphodromantis balachowskyi La Greca, 1967 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 18, 1: 24-27.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Yangambi (Stanleyville).
3 PT: ♂♂; loc. typ.

Sphodromantis conspicua La Greca, 1967 [Mantidae]
Ann. Ist. Mus. Zool. Univ. Napoli, 18, 1: 14-19.
LOC. TYP.: SENEGAL, Badi (Niokolo-Koba).
1 PT: ♂; SENEGAL, Thiès.

Sphodromantis elongata La Greca, 1969 [Mantidae]
Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 4, 9, 10: 685-690.
LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo], Upper Katanga, zone of Elisabethville.
1 ST: ♂; loc. typ., Elisabethville; 4 April 1953; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.
1 ST: ♂; loc. typ., Elisabethville; 1 May 1953; Ch. Seydel leg.; det. M. La Greca; extracted genitalia; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.
1 ST: ♂; loc. typ., Elisabethville; 23 March 1957; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Elisabethville; 27 March 1957; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Elisabethville; 3 April 1957; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Elisabethville; 15 April 1957; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Elisabethville; 24 March 1958; Ch. Seydel leg.; det. M. La Greca; extracted genitalia; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Elisabethville; 19 April 1958; Ch. Seydel leg.; det. M. La Greca; extracted genitalia; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Elisabethville; 5 May 1958; Ch. Seydel leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously labelled as paratype; labelled as syntype by A. Castellani 2003.

NOTES: The original description included 9 specimens (8 males and 1 female) now in La Greca's collection, and many other specimens from the Musée Royal de l'Afrique Centrale (Tervuren, Belgium). Therefore the 9 specimens listed above are part of the type series. In the original description the holotype was not designated, so all the specimens in the type series are syntypes.

Sphodromantis lineola ssp. *pinguis* La Greca, 1967 [Mantidae]

Ann. Ist. Mus. Zool. Univ. Napoli, 18, 1: 14.

LOC. TYP.: DEM. REP. OF THE CONGO [former Belgian Congo].

1 ST: ♂; loc. typ., Lower Congo, Léopoldville; December 1950 - January 1951; P. Jobels leg.; det. M. La Greca; extracted genitalia, numbered as "9"; a label reads "Coll. Mus. Congo", another one reads "9"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Lower Congo, Mayidi; 1942; Rév. P. Van Eyen leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Lower Congo, Banana (Tshikay); March 1949; A. T. Marée leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Stanleyville, Wanie-Rukula (65 km south of Stanleyville); July 1947; Dr. M. Poll leg.; det. M. La Greca; extracted genitalia, numbered as "7"; a label reads "Coll. Mus. Congo", another one reads "7"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Kibali-Ituri, Yindi; October 1948 - March 1949; A. E. Betrand leg.; det. M. La Greca; extracted genitalia, numbered as "12"; a label reads "Coll. Mus. Congo", another one reads "12"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Kibali-Ituri, Kilo; April 1931; G. du Soleil leg.; det. M. La Greca; a label reads "Musée du Congo"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Kibali-Ituri, Mahagi-Port; September 1934; H. J. Brédo leg.; det. M. La Greca; a label reads "Coll. Mus. Congo"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♂; loc. typ., Upper Lomami, Kanlama; 1931; R. Massart leg.; det. M. La Greca; extracted genitalia, extended wings; a label reads "Coll. Mus. Congo"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Sankuru, Gandajika; 24 October 1950; P. de Francquen leg.; det. M. La Greca; a label reads "Coll. Mus. Congo" and "00307"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

1 ST: ♀; loc. typ., Sankuru, Gandajika; 31 October 1950; P. de Francquen leg.; det. M. La Greca; a label reads "Coll. Mus. Congo" and "00646"; previously not labelled as type; labelled as syntype by A. Castellani 2003.

NOTES: The original description included 10 specimens (4 males and 6 females) now in La Greca's collection, and many other specimens from the Musée Royal de l'Afrique Centrale (Tervuren, Belgium) and from M. Pavan's collection (Pavia, Italy). Therefore the 10 specimens listed above are part of the type series. In the original description the holotype was not designated, so all the specimens in the type series are syntypes. La Greca labelled a male from Lukolela (in Tshuapa, Dem. Rep. of the Congo) as lectotype; though, since this specimen is not part of the type series, it cannot be considered as a valid lectotype.

Sphodromantis pardii La Greca & Lombardo, 1987 [Mantidae]

Mon. Zool. Ital., 13: 210-213.

LOC. TYP.: SOMALIA, Rocca Littorio [Gallacaio].

1 PT: ♂; SOMALIA, Garoe.

Sphodromantis royi La Greca, 1967 [Mantidae]

Eos, 42, 3-4: 512-513.

LOC. TYP.: SENEGAL, Richard-Toll.

1 PT: ♂; loc. typ.

Sphodromantis viridis ssp. *barbara* La Greca, 1967 [Mantidae]

Eos, 42, 3-4: 502-506.

LOC. TYP.: LIBYA, TUNISIA and ALGERIA.

1 ST: ♂; LIBYA, Tripolitania, Gat; October 1936; G. Scortecci leg.; det. M. La Greca; extended wings; previously labelled as holotype; labelled as syntype by A. Castellani 2003; fig. 1.

1 ST: ♀; LIBYA, Tripolitania, Gat; October 1936; G. Scortecci leg.; det. M. La Greca; extended wings; previously labelled as allotype; labelled as syntype by A. Castellani 2003; fig. 1.

1 ST: ♂; LIBYA, Tripolitania, Gat; October 1936; G. Scortecci leg.; det. M. La Greca; extended wings; previously labelled as paratype; labelled as syntype by A. Castellani 2003; fig. 1.

1 ST: ♂; LIBYA, Tripolitania, Bu-Aissa; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously not labelled as type; labelled as syntype by A. Castellani 2003; fig. 1.

NOTES: The original description included the 7 specimens now in La Greca's collection. Among these, 3 specimens (1 male and 2 females from the Algerian Sahara) were included doubtfully; so, they are not part of the type series. Therefore only the remaining 4 specimens (2 males and 1 female from Gat, and 1 male from Bu-Aissa) are part of the type series. In the original description the holotype was not designated, so all the specimens in the type series are syntypes.

Sphodromantis viridis ssp. *meridionalis* La Greca, 1950 [Mantidae]

Riv. Biol. Col., 10: 92-94.

LOC. TYP.: ETHIOPIA, Sagan-Omo, Gondaraba.

1 AT: ♂; loc. typ.; fig. 1.

2 PT: ♀ ♀; loc. typ.; fig. 1.

Sphodromantis viridis ssp. *simplex* La Greca & Lombardo, 1987 [Mantidae]

Mon. Zool. Ital., 13: 201-203.

LOC. TYP.: ETHIOPIA, Melka Warar.

1 **HT**: ♂; loc. typ.; February 1969; det. M. La Greca & F. Lombardo; extracted genitalia; fig. 1.

Rivetina baetica ssp. *tenuidentata* La Greca & Lombardo, 1983 [Mantidae]

Animalia, 9: 353-356.

LOC. TYP.: ITALY, Sicily, Magnisi peninsula (Syracuse).

1 **LT**: ♂; loc. typ.; 9 July 1961; M. La Greca leg.; det. M. La Greca; extracted genitalia, extended wings; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 5.

1 PLT: ♀; ITALY, Sicily, Siracusa; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♀; ITALY, Sicily, Siracusa; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♀; ITALY, Sicily, west of Selinunte (near Agrigento), dunes; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♀; ITALY, Sicily, mouth of the Imera river (near Termini); previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♀; ITALY, Sicily, Cala Buguto, Mt. Cofano (near Erice, Trapani); previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

3 PLT: ♀ ♀; ITALY, Sicily, Pantelleria island (airport); previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

3 PLT: 1 ♂ + 2 ♀ ♀; ITALY, Sicily, Pantelleria island; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description stated Sicily as the type locality, from where the 12 specimens (2 males and 10 females) listed above come; therefore these 12 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled the well preserved male (fig. 5) from Magnisi peninsula as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes, and Magnisi peninsula becomes the type locality.

Lectotype measurements: BLT: 50.3 mm; PL: 12.8 mm; PW: 3.3 mm; FFL: 12.2 mm; FFW: 1.9 mm.

Rivetina inermis ssp. *iranica* La Greca & Lombardo, 1983 [Mantidae]

Animalia, 9: 373-374.

LOC. TYP.: IRAN, Bushire.

1 PT: ♂; loc. typ., a label reads "92, 33".

Rivetina karadumi Lindt, 1961 [Mantidae]
Trudy Inst. Zool. Par. Pavl. Tad. SSR, 20: 57-65.
LOC. TYP.: TAJIKISTAN, south-western Tajikistan, settlement of Pjand?, Kara-Dum sands.
1 **HT**: ♂; loc. typ.; 5 August 1957; I. I. Lindt leg.; det. I. I. Lindt; badly damaged, then restored.
1 AT: ♀; loc. typ.

Order ORTHOPTERA: suborder ENSIFERA

Metaplastes ippolitoi La Greca, 1948 [Phaneropteridae Barbitistinae]
Boll. Soc. Nat. Napoli, 57, 10: 1-3.
LOC. TYP.: ITALY, Calabria, Sila, Mt. Cozzo della Vitalba (Longobucco), 1,200 m.
1 **HT**: ♂; loc. typ [but labelled "900 m"]; July 1948; M. La Greca leg.; det. M. La Greca.

Poecilimon jonicus ssp. *lobulatus* F. Willemse, 1982. [Phaneropteridae Barbitistinae]
Tijdschr. Ent., 125, 6: 167.
LOC. TYP.: GREECE, near Dhodhóni, 8 km north of Kaléntzion, 950 m.
6 PT: 4 ♂♂ + 2 ♀♀; GREECE, Métsovon (Ioánnina), 1,600 m.
1 PT: ♂; GREECE, Arísti (Ioánnina), 700 m.

Parnassiana gionica La Greca & Messina, 1977 [Tettigoniidae Decticinae]
Animalia, 3: 207-212.
LOC. TYP.: GREECE, Mt Giona (Amfissa), 1,400-1,900 m.
1 **HT**: ♂; loc. typ., 1,900 m; 13 August 1973; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ., 1,900 m.
4 PT: 1 ♂ + 3 ♀♀; loc. typ., 1,900 m.

Eupholidoptera danconai La Greca, 1959 [Tettigoniidae Decticinae]
Mem. Biogeogr. Adriat., 4: 65-66.
LOC. TYP.: ITALY, Basilicata [former Lucania], Irsina (Matera).
1 **HT**: ♂; loc. typ.; 21 July 1957; det. M. La Greca; extracted genitalia; fig. 2.
1 AT: ♀; loc. typ.; fig. 2.
5 PT: 2 ♂♂ + 3 ♀♀; loc. typ.; fig. 2.

Eupholidoptera garganica La Greca, 1959 [Tettigoniidae Decticinae]
Mem. Biogeogr. Adriat., 4: 66-67.
LOC. TYP.: ITALY, Apulia, Gargano, Foresta Umbra.
1 **HT**: ♂; loc. typ.; 24 July 1957; det. M. La Greca; extracted genitalia; fig. 2.
1 AT: ♀; loc. typ.; fig. 2.
1 PT: ♂; loc. typ.; fig. 2.

Eupholidoptera hesperica La Greca, 1959 [Tettigoniidae Decticinae]
Mem. Biogeogr. Adriat., 4: 64.
LOC. TYP.: ITALY, Basilicata [former Lucania], Atella (Potenza).
1 **HT**: ♂; loc. typ.; 12 July 1957; det. M. La Greca; extracted genitalia; fig. 2.
1 PT: ♂; loc. typ.; fig. 2.
1 PT: ♂; ITALY, Campania, Pertosa (Salerno); fig. 2.

Yersinella beybienkoi La Greca, 1974 [Tettigoniidae Decticinae]
Boll. Soc. Ent. Ital., 106, 3-4: 60-64.
LOC. TYP.: ITALY, Emilia-Romagna, Mt. Mescolino (Cesena), 850 m.
1 **HT**: ♂; loc. typ.; 17 August 1972; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ., 600 m.
12 PT: 10 ♂♂ + 2 ♀♀; loc. typ.

Pterolepis siciliensis La Greca, 1980 [Tettigoniidae Decticinae]
Animalia, 6: 81-87.
LOC. TYP.: ITALY, Sicily, dunes near Capo Feto (between Mazara del Vallo and Marsala).
1 AT: ♀; loc. typ.
4 PT: ♀♀; loc. typ.
NOTES: Galvagni (1981: 169; 1985: 149-150) demonstrated that *Pterolepis siciliensis* La Greca, 1980 is a junior synonym of *Pterolepis elymica* Galvagni & Massa, 1980 (described as *Pterolepis pedata elymica* in Galvagni & Massa 1980: 76-80).

Rhacocleis grisea Baccetti, 1991 [Tettigoniidae Decticinae]
Ann. Mus. Civ. St. Nat. Doria, 88: 433-442.
LOC. TYP.: ITALY, Sardinia, Serpentara island.
1 PT: ♂; loc. typ.
1 PT: ♀; loc. typ.; matured in laboratory.

Rhacocleis japygia La Greca, 1959 [Tettigoniidae Decticinae]
Mem. Biogeogr. Adriat., 4: 47-49.
LOC. TYP.: ITALY, Basilicata [former Lucania], Irsina (Matera).
1 **HT**: ♂; loc. typ.; 21 July 1957; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
9 PT: 6 ♂♂ + 3 ♀♀; loc. typ.

Rhacocleis trilobata La Greca & Messina, 1975 [Tettigoniidae Decticinae]
Animalia, 1: 175-183.
LOC. TYP.: GREECE, Peloponnese, Trikala, Mt Kyllini, 1,150 m.
1 **HT**: ♀; loc. typ.; 17 August 1973; M. La Greca leg.; det. M. La Greca.
1 AT: ♂; loc. typ.
12 PT: 4 ♂♂ + 8 ♀♀; loc. typ.

Rhacocleis tyrrhenica La Greca, 1952 [Tettigoniidae Decticinae]
Ann. Ist. Mus. Zool. Univ. Nap., 4, 6: 1-6.
LOC. TYP.: ITALY, Latium, Pontine islands, Zannone island.
1 **HT**: ♂; loc. typ.; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.

Ephippiger apulus ssp. *italicus* La Greca, 1959 [Bradyporidae Ephippigerinae]
Mem. Biogeogr. Adriat., 4: 82-84.
LOC. TYP.: ITALY, Basilicata [former Lucania], Atella (Potenza).
1 **LT**: ♂; loc. typ.; 12 July 1957; det. M. La Greca; extracted genitalia; previously not labelled as type; designated and labelled as lectotype by A. Castellani 2003; fig. 6.

24 PLT: 17 ♂♂ + 7 ♀♀; loc. typ.; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description stated the population of Atella as type population; therefore the type series includes the 25 specimens (18 males and 7 females) from Atella listed above. The holotype was not designated in the original description, which nevertheless featured some figures of the types from Atella. A well preserved male specimen (fig. 6) in the type series fits very well with the figures 91 and 99 in the original description. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes, and Atella becomes the type locality.

Lectotype measurements: BL: 36.7 mm; PL: 7.9 mm; HFL: 19.7 mm.

Ephippiger ruffoi Galvagni, 1955 [Bradyporidae Ephippigerinae]

Mem. Mus. Civ. St. Nat. Verona, 5: 39-44.

LOC. TYP.: ITALY, Umbria, Sibylline Mts, Piano Grande, 1,270 m.

3 PT: 2 ♂♂ + 1 ♀; loc. typ.

2 PT: 1 ♂ + 1 ♀; loc. typ., Castelluccio di Norcia.

Steropleurus annae (Targioni-Tozzetti, 1881) [Bradyporidae Ephippigerinae]

Ephippigera Annae, Bull. Soc. Ent. Ital., 13: 181-182.

LOC. TYP.: ITALY, Sardinia, Mt Corrasi, 1,350-1,400 m.

1 NT: ♂; loc. typ.; 11 August 1962; A. Goidanich leg.; det. P. Fontana & F. M. Buzzetti, October 2000; extracted genitalia; other labels read: "breeding; N. 1441; Ephip. coronata; A. Goidanich leg."; "Ephippigera annae Targioni-Tozzetti, 1881; Neotype; det. P. Fontana & F. M. Buzzetti"; "Steropleurus annae (Targ.-Tozz.); det. La Greca".

NOTES: This neotype has been designated by Fontana & Buzzetti (2001).

Steropleurus cockerelli ssp. *timhaditensis* (Nadig, 1976) [Bradyporidae Ephippigerinae]

Uromenus (*Steropleurus*) *cockerelli* ssp. *timhaditensis*, Revue Suisse Zool., 83, 2: 343-344.

LOC. TYP.: MOROCCO, central Middle Atlas, environs of Timhadite, 2,000 m.

2 PT: 1 ♂ + 1 ♀; loc. typ., northern part, 8 km north of Timhadite (70:91).

Bolivarius brevicollis ssp. *trinacriae* (La Greca, 1964) [Bradyporidae Ephippigerinae]

Uromenus brevicollis ssp. *trinacriae*, Atti Acc. Gioenia Sc. Nat. Catania, 6, 16: 4-7.

LOC. TYP.: ITALY, Sicily, Nebrodi Mts, Pizzo Castellano, 1,200 m.

1 **LT**: ♀; loc. typ.; 28 September 1963; M. La Greca leg.; det. M. La Greca; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 7.

1 PLT: ♂; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♂; loc. typ.; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♂; ITALY, Sicily, Nebrodi Mts, Castel di Lucio; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♂; ITALY, Sicily, Madonie Mts, Contrada Quacella; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

4 PLT: 1 ♂ + 3 ♀♀; ITALY, Sicily, Madonie Mts, Geraci Siculo, 1,100 m; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

1 PLT: ♂; ITALY, Sicily, Madonie Mts, Torre Montaspro, 900 m; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description included in the new subspecies some specimens from different Sicilian localities (Pizzo Castellano, Castel di Lucio, Contrada Quacella, Geraci Siculo, Torre Montaspro), and there are 10 specimens (6 males and 4 females) with these features in La Greca's collection; therefore these 10 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled the well preserved female (fig. 7) from Pizzo Castellano as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes, and Pizzo Castellano becomes the type locality.

Lectotype measurements: BL: 29.9 mm; PL: 5.7 mm; HFL: 16.5 mm; OL: 16.6 mm.

Bolivarius ceretanus (Kruseman & Jeekel, 1964) [Bradyporidae Ephippigerinae]

Steropleurus ceretanus, Beaufortia, 133, 11: 33-36.

LOC. TYP.: FRANCE, eastern Pyrenees, Courbasil, 1,400 m.

2 PT: ♂♂; loc. typ.

Uromenus riggioi La Greca, 1964 [Bradyporidae Ephippigerinae]

Atti Acc. Gioenia Sc. Nat. Catania, 6, 16: 9-13.

LOC. TYP.: ITALY, Sicily, Hyblaean Mts, between Francofonte and Vizzini (Catania).

1 **LT**: ♂; loc. typ.; 16 July 1963; M. La Greca leg.; det. M. La Greca; previously labelled as paratype; designated and labelled as lectotype by A. Castellani 2003; figs. 3, 8.

1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003; fig. 3.

42 PLT: 24 ♂♂ + 18 ♀♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003; fig. 3.

LECTOTYPE DESIGNATION: A specimen in La Greca's collection was labelled as holotype, but its label reads "25 July 1964", and the original description was presented on 18 May 1964; so, this specimen cannot be considered as part of the type series. According to the original description, the type series should include many specimens from the environs of Vizzini, collected about the middle of June 1963. No specimen in the collection is labelled as collected in June 1963, but 25 males and 19 females are labelled "16 July 1963". I believe that there was a mistake in either the paper or the labels, and that the 44 specimens listed above constitute the type series. Among them, a well mounted and well preserved male (fig. 8) displays the distinctive characters of the species better than the other type specimens do. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes.

Lectotype measurements: BL: 35.0 mm; PL: 10.2 mm; HFL: 19.3 mm.

Troglophilus andreinii ssp. *hydruntinus* La Greca, 1961 [Rhaphidophoridae Troglophilinae]

Boll. Soc. Ent. Ital., 91, 5-6: 88-90.

LOC. TYP.: ITALY, Apulia, cave Madonna della Rutta (Presicce, south of Otranto).

1 **LT**: ♂; loc. typ.; 10 January 1949; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously not labelled as type; designated and labelled as lectotype by A. Castellani 2003; fig. 9.

2 PLT: 1 ♂ + 1 ♀; loc. typ.; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

2 PLT: 1 ♂ + 1 ♀; ITALY, Apulia, cave Grotta dei Diavoli (Porto Badisco, Otranto); previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

LECTOTYPE DESIGNATION: These specimens found in La Greca's collection, all caught in January 1949, correspond very well to the localities and the figures in the original description; therefore they constitute the type series. The well preserved male (fig. 9) from the cave Madonna della Rutta, whose genitalia were extracted, is illustrated very well in the figures 4, 7, 13, 21 of the original description. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes, and the cave Madonna della Rutta becomes the type locality.

Lectotype measurements: BL: 27.1 mm; PL: 4.7 mm; HFL: 17.9 mm.

Phaeophilacris chopardi La Greca, 1978 [Gryllidae Phalangopsinae]

Quad. Acc. Naz. Lincei, 243: 64-69.

LOC. TYP.: ETHIOPIA, Kaffa, Anderaccia (cave), natural bridge of Gurgutto, about 1,650 m.

2 PT: 1 ♂ + 1 ♀; loc. typ.

Order ORTHOPTERA: suborder CAELIFERA

Paraeumigus bolivari La Greca, 1993 [Pamphagidae Pamphaginae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 389-393.

LOC. TYP.: MOROCCO, western Upper Atlas, Tizi-n-Tichka (67:16), 2,000 m.

2 PT: 1 ♂ + 1 ♀; loc. typ.

Euryparyphes atlasicus La Greca, 1993 [Pamphagidae,Pamphaginae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 348-351.

LOC. TYP.: MOROCCO, eastern Upper Atlas, Jebel Ayachi, Tizi-n-Tirecht (68:61), 2,900-3,390 m.

2 PT: 1 ♂ + 1 ♀; loc. typ.

Euryparyphes breviphallus La Greca, 1993 [Pamphagidae Pamphaginae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 353-355.

LOC. TYP.: MOROCCO, Upper Atlas, Tizi-n-Tirrhist, Ait Bou Guémes (68:86), 2,500-2,800 m.

2 PT: 1 ♂ + 1 ♀; loc. typ.

Euryparyphes cinerascens La Greca, 1993 [Pamphagidae Pamphaginae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 356-360.

LOC. TYP.: MOROCCO, Rif, Ketama (in a cedar grove), 1,620 m.

1 **HT**: ♂; loc. typ.; 21 April 1986; Grasso leg.; det. M. La Greca; extracted genitalia.

1 AT: ♀; loc. typ.

1 PT: ♂; loc. typ.

Euryparyphes defauti La Greca, 1993 [Pamphagidae Pamphaginae]

Euryparyphes défauti, Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 328-330.

LOC. TYP.: MOROCCO, zone of Meknes, Oulmès (M 110, M 111, M 246).

6 PT: 3 ♂♂ + 3 ♀♀; loc. typ.

Euryparyphes gharbensis Defaut, 1987 [Pamphagidae Pamphaginae]
Euryparyphes laetus ssp. *gharbensis*, L'Entomologiste, 43 (2): 110, 168.
LOC. TYP.: MOROCCO, 17 km east-north-east of Sidi Yahya du Gharb, erme.
1 PT: ♂; loc. typ. (M 299, M 300).
1 PT: ♂; MOROCCO, Ksar el Kébir (M 122).
2 PT: ♀ ♀; MOROCCO, Sidi Slimane (M 302, M 303).

Euryparyphes mamorensis Defaut, 1987 [Pamphagidae Pamphaginae]
Euryparyphes marocanus ssp. *mamorensis*, L'Entomologiste, 43 (2): 109, 167.
LOC. TYP.: MOROCCO, 12 km north-east of Tiflète, erme.
2 PT: 1 ♂ + 1 ♀; loc. typ. (M 307).

Euryparyphes nigripes La Greca, 1993 [Pamphagidae Pamphaginae]
Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 351-352.
LOC. TYP.: MOROCCO, eastern Upper Atlas, Plateau-des-Lacs (70:120), 2,300-2,400 m.
2 PT: 1 ♂ + 1 ♀; loc. typ.

Euryparyphes tazzekensis La Greca, 1993 [Pamphagidae Pamphaginae]
Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 26, 341: 330-333.
LOC. TYP.: MOROCCO, Middle Atlas (northern slopes), Jebel Tazzeka (69:39), 1,800-1,980 m.
1 PT: ♂; loc. typ.

Cryptonothrotes pseudoapterus La Greca, 2004 [Pamphagidae Pamphaginae]
Mem. Soc. Ent. Ital., 82(2): 507.
LOC. TYP.: AFGHANISTAN, Herat district, between Herat and Qal'eh-ye Now, some km before Sabzak Pass.
1 **HT**: ♂; loc. typ.; 8-16 June 1977; A. Simonetta leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
1 PT: ♀; loc. typ.

Italopodisma acuminata (La Greca, 1969) [Catantopidae Podisminae]
Cophopodisma acuminata, Mem. Soc. Ent. Ital., 48: 552-554.
LOC. TYP.: ITALY, Abruzzo, Abruzzo National Park, Mt Greco (Roccaraso), 2,000 m.
1 **HT**: ♂; loc. typ.; 3 August 1966; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
60 PT: 24 ♂♂ + 36 ♀ ♀; loc. typ.

Italopodisma acuminata ssp. *marsicana* (La Greca, 1969) [Catantopidae Podisminae]
Cophopodisma acuminata ssp. *marsicana*, Mem. Soc. Ent. Ital., 48: 554.
LOC. TYP.: ITALY, Abruzzo, Abruzzo National Park, Mt Palombo (Pescasseroli), 1,900 m.
1 **LT**: ♂; loc. typ.; 10 August 1966; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 10.
1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.
18 PLT: 8 ♂♂ + 10 ♀ ♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003.
LECTOTYPE DESIGNATION: The original description stated Mt Palombo as the type locality, from where the 20 specimens (9 males and 11 females) listed above come;

therefore these 20 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 10) with extracted genitalia as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes.

Lectotype measurements: BL: 17.7 mm; PL: 3.9 mm; HFL: 9.2 mm.

Italopodisma baccettii (La Greca, 1969) [Catantopidae Podisminae]

Cophopodisma baccettii, Mem. Soc. Ent. Ital., 48: 550.

LOC. TYP.: ITALY, Abruzzo, Gran Sasso, Campo Imperatore, 2,000 m.

1 **HT**: ♂; loc. typ.; 1-10 September 1958; B. Baccetti leg.; det. M. La Greca; extracted genitalia.

1 PT: ♂; loc. typ.

Italopodisma ebneri (La Greca, 1954) [Catantopidae Podisminae]

Cophopodisma costai ssp. *ebneri*, Ann. Ist. Mus. Zool. Univ. Napoli, 6, 7: 11.

LOC. TYP.: ITALY, Latium, Mt Terminillo.

1 ST: ♂; loc. typ.; 6 August 1912; R. Ebner leg.; det. M. La Greca; another label reads "Podisma costae Targ.; ♂; det. R. Ebner 1914"; previously labelled as holotype; labelled as syntype by A. Castellani 2003.

NOTES: The original description included some specimens from Mt. Terminillo, collected by Ebner in 1912. Only one specimen in La Greca's collection matches these data, therefore it is part of the type series. In the original description the holotype was not designated, so all the specimens in the type series, including the one in La Greca's collection, are syntypes.

Italopodisma lagrecai (Galvagni, 1973) [Catantopidae Podisminae]

Cophopodisma lagrecai, Studi Trent. Sc. Nat., B, 50, 1: 30-33.

LOC. TYP.: ITALY, Abruzzo, Gran Sasso, north-eastern slope of the Corno Piccolo.

4 PT: 2 ♂♂ + 2 ♀♀; loc. typ., Prati di Tivo, La Madonnina, 2,250 m.

Italopodisma lucianae (Baccetti, 1959) [Catantopidae Podisminae]

Cophopodisma samnitica ssp. *lucianae*, Redia, 44: 271-276.

LOC. TYP.: ITALY, Abruzzo, Maiella, slopes of Mt Tavola Rotonda, 1,700-1,800 m.

3 PT: 2 ♂♂ + 1 ♀; loc. typ.

1 PT: ♀; ITALY, Abruzzo, Maiella, Mt Amaro, 2,600-2,900 m.

Italopodisma samnitica (La Greca, 1954) [Catantopidae Podisminae]

Cophopodisma samnitica, Ann. Ist. Mus. Zool. Univ. Napoli, 6, 7: 11-14.

LOC. TYP.: ITALY, Molise, Matese, La Gallinola, 1,700-1,900 m.

1 **LT**: ♂; loc. typ.; 22 August 1949; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously labelled as type; designated and labelled as lectotype by A. Castellani 2003; fig. 11.

1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.

2 PLT: ♂♂; loc. typ., 1,600-1,900 m; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003.

1 PLT: ♀; loc. typ., 1,600-1,900 m; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description stated La Gallinola as the type locality, from where the 5 specimens (3 males and 2 females) listed above come; therefore these 5 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 11) with extracted genitalia as type (meaning holotype, since the other two males are labelled as paratypes). Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes.
Lectotype measurements: BL: 18.9 mm; PL: 3.8 mm; HFL: 9.8 mm.

Italopodisma trapezoidalis (La Greca, 1966) [Catantopidae Podisminae]

Cophopodisma trapezoidalis, Atti Acc. Naz. Ital. Ent. Rend., 13: 19-33.

LOC. TYP.: ITALY, Abruzzo, Abruzzo National Park, La Meta, Valle Lunga (Barrea), 1,900 m.

1 **HT**: ♂; loc. typ.; 8 August 1966; M. La Greca leg.; det. M. La Greca; extracted genitalia; fig. 4.

1 AT: ♀; loc. typ.; fig. 4.

71 PT: 26 ♂♂ + 45 ♀♀; loc. typ.; fig. 4.

Italopodisma trapezoidalis ssp. *aprutiana* (La Greca, 1969) [Catantopidae Podisminae]

Cophopodisma trapezoidalis ssp. *aprutiana*, Mem. Soc. Ent. Ital., 48: 552.

LOC. TYP.: ITALY, Abruzzo, Abruzzo National Park, refuge Pesco di Iorio, 1,870 m.

1 **LT**: ♂; loc. typ.; 22 August 1964; Ronsisvalle leg.; det. M. La Greca; extracted genitalia; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; figs. 4, 12.

1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003; fig. 4.

9 PLT: 3 ♂♂ + 6 ♀♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003; fig. 4.

LECTOTYPE DESIGNATION: The original description stated the refuge Pesco di Iorio as the type locality, from where the 11 specimens (4 males and 7 females) listed above come; therefore these 11 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 12) with extracted genitalia as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes.
Lectotype measurements: BL: 20.4 mm; PL: 4.5 mm; HFL: 10.5 mm.

Italopodisma trapezoidalis ssp. *curvula* (La Greca, 1969) [Catantopidae Podisminae]

Cophopodisma trapezoidalis ssp. *curvula*, Mem. Soc. Ent. Ital., 48: 552.

LOC. TYP.: ITALY, Latium, Ernici Mts, Campo Catino, 1,750-1,850 m.

1 **LT**: ♂; loc. typ.; 1 August 1963; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; figs. 4, 13.

1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003; fig. 4.

9 PLT: 3 ♂♂ + 6 ♀♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003; fig. 4.

12 PLT: 7 ♂♂ + 5 ♀♀; loc. typ.; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003; fig. 4.

LECTOTYPE DESIGNATION: The original description stated Campo Catino as the type locality, from where the 23 specimens (11 males and 12 females) listed above come; therefore these 23 specimens are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 13) with extracted genitalia as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens in the type series become paralectotypes. Lectotype measurements: BL: 19.5 mm; PL: 4.0 mm; HFL: 10.4 mm.

Oropodisma erymanthosi F. Willemse, 1971 [Catantopidae Podisminae]
Publ. Natuurhist. Gen. Limburg, 20: 23-25.
LOC. TYP.: GREECE, Peloponnese, Mt Erymanthos, above Kalentzi, 1,700-2,000 m.
2 PT: 1 ♂ + 1 ♀; loc. typ.

Oropodisma karavica La Greca & Messina, 1977 [Catantopidae Podisminae]
Animalia, 3: 6-10.
LOC. TYP.: GREECE, southern Pindus, Mt Karava, 2,000 m.
1 **HT**: ♂; loc. typ.; 5 August 1973; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
8 PT: 4 ♂♂ + 4 ♀♀; loc. typ.

Oropodisma kyllinii F. Willemse, 1971 [Catantopidae Podisminae]
Publ. Natuurhist. Gen. Limburg, 20: 25.
LOC. TYP.: GREECE, Peloponnese, Mt Kyllini, above Trikala, 1,700-2,000 m.
1 PT: ♂; loc. typ.

Oropodisma lagrecai F. Willemse, 1979 [Catantopidae Podisminae]
Ent. Berichten, 39: 108-111.
LOC. TYP.: GREECE, Evritanía, Panaitolikón Mts, Xerovoúni (above Proussós), 1,400-1,650 m.
1 PT: ♂; loc. typ.

Oropodisma willemsei La Greca & Messina, 1977 [Catantopidae Podisminae]
Animalia, 3: 10-13.
LOC. TYP.: GREECE, Mt Giona (Amfissa), 1,900 m.
1 **HT**: ♂; loc. typ.; 13 August 1973; M. La Greca leg.; det. M. La Greca; extracted genitalia.
1 AT: ♀; loc. typ.
12 PT: 6 ♂♂ + 6 ♀♀; loc. typ.

Pseudopodisma nagyi Galvagni & Fontana, 1996 [Catantopidae Podisminae]
Atti Acc. Rov. Agiati, 245, 7, 5, B: 209-232.
LOC. TYP.: HUNGARY, north-eastern Hungary, Mátra Mts, Galyatetö, 930 m.
4 PT: 2 ♂♂ + 2 ♀♀; loc. typ.

Iranella simonettai La Greca, 2004 [Catantopidae Catantopinae]
Mem. Soc. Ent. Ital., 82(2)(2003): 508-509.
LOC. TYP.: AFGHANISTAN, Herat district, between Ghurian and the Iranian frontier, subdesertic pastures on hills.
1 **HT**: ♂; loc. typ.; June 1977; A. Simonetta leg.; det. M. La Greca; extended wings.

Heteracris adspersa ssp. *massai* Galvagni, 1978 [Catantopidae Eyprepocnemidinae]
Atti Acc. Rov. Agiati, 226-227, 6, 16-17, B: 163-174.
LOC. TYP.: ITALY, Sardinia, Quartu Sant'Elena, pond Simbirizzi, 17 m.
1 **HT**: ♂; loc. typ.; 4 September 1977; A. Galvagni leg.; det. A. Galvagni.
1 PT: ♂; loc. typ.

Heteracris lieutaghii Defaut, 1986 [Catantopidae Eyprepocnemidinae]
Bull. Soc. Hist. Nat. Toulouse, 122: 19-21.
LOC. TYP.: MOROCCO, near Mehdya, 34° 16' 37" N, 6° 41' 32" W, 10 m.
1 PT: ♂; MOROCCO, Maaziz, 60 km south-east of Rabat (M 176).
1 PT: ♀; MOROCCO, Mehdya (beach), near Rabat (M 159).

Tropidopola graeca ssp. *transjonica* La Greca, 1964 [Catantopidae Tropidopolinae]
Ann. Ist. Mus. Zool. Univ. Napoli, 16, 5: 16-17.
LOC. TYP.: ITALY, Apulia, mouth of the Lato river (Taranto).
1 **LT**: ♂; loc. typ.; 25 August 1963; M. La Greca leg.; det. M. La Greca; extracted genitalia; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 14.
1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.
18 PLT: 15 ♂♂ + 3 ♀♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003.
49 PLT: 1 ♂ + 48 nymphs; loc. typ.; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.
LECTOTYPE DESIGNATION: The original description included all the 69 specimens now in La Greca's collection; therefore these 69 specimens (17 males, 4 females, and 48 nymphs) are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 14) as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens become paralectotypes.
Lectotype measurements: BL: 27.0 mm; PL: 5.2 mm; HFL: 13.0 mm.

Afroxyrrhepes luteipes La Greca, 1993 [Catantopidae Tropidopolinae]
Riv. Mus. Civ. Sc. Nat. Caffi Bergamo, 16: 90-93.
LOC. TYP.: SUDAN, Torit.
2 PT: 1 ♂ + 1 ♀; SUDAN, Okaru.

Sphingonotus miramae Mistshenko, 1937 [Acrididae Oedipodinae]
Eos, 12: 138.
LOC. TYP.: TURKMENISTAN, Bajram-Ali.
1 PT: ♂; loc. typ.
1 PT: ♀; TURKMENISTAN, district of Merv.

Sphingonotus vitreus ssp. *brevipes* La Greca, 1957 [Acrididae Oedipodinae]
Boll. Ist. Ent. Univ. Bologna, 22: 57-58.
LOC. TYP.: LIBYA, Tripolitania, Hamáda el-Hámra.
2 PT: ♀♀; LIBYA, Tripolitania, Mízda.

Sphingonotus zebra Mistshenko, 1937 [Acrididae Oedipodinae]
Eos, 12: 127.
LOC. TYP.: TAJIKISTAN, Hissar range, Mt Khan-Takhta, 2,775 m.
2 PT: 1 ♂ + 1 ♀; loc. typ.

Acrotylus gracilis La Greca, 1991 [Acrididae Oedipodinae]
Animalia, 17: 181-184.
LOC. TYP.: NAMIBIA, Rehoboth.
1 **HT**: ♂; loc. typ.; 16 May 1988; Motta & Nobile leg.; det. M. La Greca; extended wings.
1 AT: ♀; loc. typ.
4 PT: 1 ♂ + 3 ♀ ♀; loc. typ.

Trilophidia namibica La Greca, 1991 [Acrididae Oedipodinae]
Animalia, 17: 275-281.
LOC. TYP.: NAMIBIA, Karkland.
1 **HT**: ♂; loc. typ.; 16 May 1988; Motta & Nobile leg.; det. M. La Greca; extended wings.
1 PT: ♀; loc. typ.; previously labelled as allotype; labelled as paratype by A. Castellani 2003.
1 PT: ♂; loc. typ.

Helioscirtus grandii La Greca, 1957 [Acrididae Oedipodinae]
Boll. Ist. Ent. Univ. Bologna, 22: 58-61.
LOC. TYP.: LIBYA, Tripolitania, Hamáda el-Hámra.
1 PT: ♀; LIBYA, Tripolitania, Mízda.

Chrysochraon beybienkoi Galvagni, 1968 [Acrididae Gomphocerinae]
Chrysochraon bey-bienkoi, Mem. Mus. Civ. St. Nat. Verona, 16: 199-208.
LOC. TYP.: ITALY, Calabria, Sila Piccola, lake Ampollino, 1,288 m.
2 PT: 1 ♂ + 1 ♀; loc. typ.

Dociostaurus minutus La Greca, 1962 [Acrididae Gomphocerinae]
Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 4, 7, 3: 115-122.
LOC. TYP.: ITALY, Sicily, Hyblaean region, Manfria (10 km west of Gela), dunes.
1 **LT**: ♂; loc. typ.; 11 August 1962; M. La Greca leg.; det. M. La Greca; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 15.
1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.
16 PLT: 12 ♂♂ + 4 ♀ ♀; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003.
6 PLT: 5 ♂♂ + 1 ♀; ITALY, Sicily, Hyblaean region, Porto Palo (near Capo Passero, Syracuse), dunes; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.
12 PLT: 8 ♂♂ +4 ♀ ♀; ITALY, Sicily, Hyblaean region, Marza (west of Pachino, Ìspica), dunes; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description included the 36 specimens (26 males and 10 females) listed above; therefore they are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 15) as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens become paralectotypes, and the dunes of Manfria become the type locality.

Lectotype measurements: BL: 12.0 mm; PL: 1.8 mm; HFL: 7.1 mm.

Dirshius lopadusae (La Greca, 1973) [Acrididae Gomphocerinae]

Omocestus lopadusae, Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 4, 12, 1-2: 17-24.

LOC. TYP.: ITALY, Sicily, Lampedusa island.

1 **LT**: ♂; loc. typ.; 2 September 1970; Ronsisvalle leg.; det. M. La Greca; previously labelled as holotype; designated and labelled as lectotype by A. Castellani 2003; fig. 16.

1 PLT: ♀; loc. typ.; previously labelled as allotype; labelled as paralectotype by A. Castellani 2003.

21 PLT: 14 ♂♂ + 5 ♀♀ + 2 nymphs; loc. typ.; previously labelled as paratypes; labelled as paralectotypes by A. Castellani 2003.

1 PLT: ♂; loc. typ., coast in front of the Isola dei Conigli; previously labelled as paratype; labelled as paralectotype by A. Castellani 2003.

1 PLT: ♂; loc. typ., Guitgia; previously labelled as paratype; labelled as paralectotype by A. Castellani 2003.

36 PLT: 12 ♂♂ + 24 nymphs; loc. typ.; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

5 PLT: 2 ♂♂ + 3 nymphs; loc. typ., coast in front of the Isola dei Conigli; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

1 PLT: 1 nymph; loc. typ., Guitgia; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

2 PLT: 2 nymphs; loc. typ., Cala Galera; previously not labelled as types; labelled as paralectotypes by A. Castellani 2003.

1 PLT: 1 nymph; loc. typ., Imbriacole; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: 1 nymph; loc. typ., Valle dell'Acqua; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

1 PLT: 1 nymph; loc. typ., Valle Madonna, beach; previously not labelled as type; labelled as paralectotype by A. Castellani 2003.

LECTOTYPE DESIGNATION: The original description included the 72 specimens (31 males, 6 females, and 35 nymphs) listed above; therefore they are part of the type series. In the original description the holotype was not designated, but La Greca himself labelled a well preserved male (fig. 16) as holotype. Thus I designate this specimen as the lectotype. Consequently the remaining specimens become paralectotypes.

Lectotype measurements: BL: 12.5 mm; PL: 2.2 mm; HFL: 7.3 mm.

Dreuxius lecerfi (Chopard, 1937) [Acrididae Gomphocerinae]

Omocestus (*Omocestus*) *le cerfi*, Bull. Soc. Sc. Nat. Maroc, 16: 1763.

LOC. TYP.: MOROCCO.

2 PT: 1 ♂ + 1 ♀; loc. typ., Ifrane - St. B. V., 1,650 m.

Dreuxius nanus (Uvarov, 1934) [Acrididae Gomphocerinae]

Omocestus nanus, Eos, 10: 81-83.

LOC. TYP.: TURKEY, Anatolian plateau.

1 PT: ♂; loc. typ., between Ankara and Tuz-Goel.

1 PT: ♀; loc. typ., between Ankara and Cheshme-Keupri, on the Kyzyl-Yrmak river.

Stenobothrus nadigi La Greca, 1986 [Acrididae Gomphocerinae]

Animalia, 12: 228-235.

LOC. TYP.: ITALY, Aosta Valley, lake Chamolet, 2,300 m.

1 **HT**: ♂; loc. typ.; 22 August 1967; M. La Greca leg.; det. M. La Greca; extracted genitalia; extended wings.

1 AT: ♀; loc. typ.

4 PT: 2 ♂♂ + 2 ♀♀; loc. typ.

NOTES: Nadig (1991) demonstrated that *Stenobothrus nadigi* La Greca, 1986 is a junior synonym of *Stenobothrus ursulae* Nadig, 1986 (described in Nadig 1986: 214-218).

Chorthippus bruttius Fontana & La Greca, 1999 [Acrididae Gomphocerinae]

Atti Acc. Rov. Agiati, 249, 7, 9, B: 19-35.

LOC. TYP.: ITALY, Calabria, La Sila, lake Ampollino, southern shore, 1,290 m.

1 **HT**: ♂; loc. typ.; 21 August 1997; P. Fontana & R. Kleukers leg.; det. M. La Greca; sound recording B. Odé, 88: 4-5 (1997).

1 AT: ♀; loc. typ.

11 PT: 7 ♂♂ + 4 ♀♀; loc. typ.

Chorthippus lacustris La Greca & Messina, 1976 [Acrididae Gomphocerinae]

Animalia, 2: 67-74.

LOC. TYP.: GREECE, Epirus, shores of lake Ioánnina.

1 **HT**: ♂; loc. typ.; 3 August 1973; La Greca & Messina leg.; det. M. La Greca; extracted genitalia, extended wings.

1 AT: ♀; loc. typ.

4 PT: 3 ♂♂ + 1 ♀; loc. typ.

Glyptobothrus albicornis (La Greca, 1948) [Acrididae Gomphocerinae]

Chorthippus albicornis, Boll. Soc. Nat. Napoli, 7: 8-11.

LOC. TYP.: ITALY, Campania, Matese, Colle del Monaco.

1 **HT**: ♂; loc. typ., 1,500 m; 22 August 1947; M. La Greca leg.; det. M. La Greca; extended wings.

1 AT: ♀; loc. typ, 1,500 m.

7 PT: 1 ♂ + 6 ♀♀; loc. typ., 1,500 m.

1 PT: ♀; loc. typ.

Glyptobothrus brunneus ssp. *raggei* La Greca, Di Mauro, Viglianisi & Monello, 2000 [Acrididae Gomphocerinae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 33, 358: 197-208.

LOC. TYP.: ITALY, Sicily, Catania, mouth of the Simeto river.

1 **HT**: ♂; loc. typ.; 13 May 1999; Viglianisi, Di Mauro & Monello leg.; det. M. La Greca; extended wings; other labels read "4 bis", "N57", "rec. A - C1".

1 AT: ♀; loc. typ.

Glyptobothrus darvazicus (Mistshenko, 1951) [Acrididae Gomphocerinae]

Chorthippus darvazicus, Saranevye Fauny SSSR i Sopredel'nykh Stran, 2: 528-529.

LOC. TYP.: TAJIKISTAN, Darvaz ridge, Sary-zakh-bursi.

2 PT: 1 ♂ + 1 ♀; loc. typ.

Glyptobothrus messinai La Greca, Di Mauro, Viglianisi & Monello, 2000 [Acrididae Gomphocerinae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 33, 358: 208-215.

LOC. TYP.: ITALY, Sicily, Mt Etna, Serra la Nave, 1,700 m.

1 **HT**: ♂; loc. typ.; 31 July 1998; Viglianisi & Di Mauro leg.; det. M. La Greca; extended wings; other labels read "5 bis", "N26", "rec 0 A".

1 AT: ♀; loc. typ.

Glyptobothrus trinacriae La Greca, Di Mauro, Viglianisi & Monello, 2000 [Acrididae Gomphocerinae]

Boll. Sed. Acc. Gioenia Sc. Nat. Catania, 33, 358: 215-219.

LOC. TYP.: ITALY, Sicily, Nebrodi Mts, state road to Mt. Soro (100 m), Portella Femmina Morta, 1,524 m.

1 **HT**: ♂; loc. typ.; 3 August 1998; Sabella, Viglianisi & Monello leg.; det. M. La Greca; extended wings; other labels read "6 bis", "1 rec".

1 AT: ♀; loc. typ.

ACKNOWLEDGMENTS

I am very grateful to Fabrizio Rigato (Museo Civico di Storia Naturale di Milano), who encouraged me to devote myself to the study of entomology, granted me the honour of studying Marcello La Greca's collection and library, and gave me many precious suggestions about this work.

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Finally, I desire to address a respectful thought to the memory of the late Marcello La Greca.

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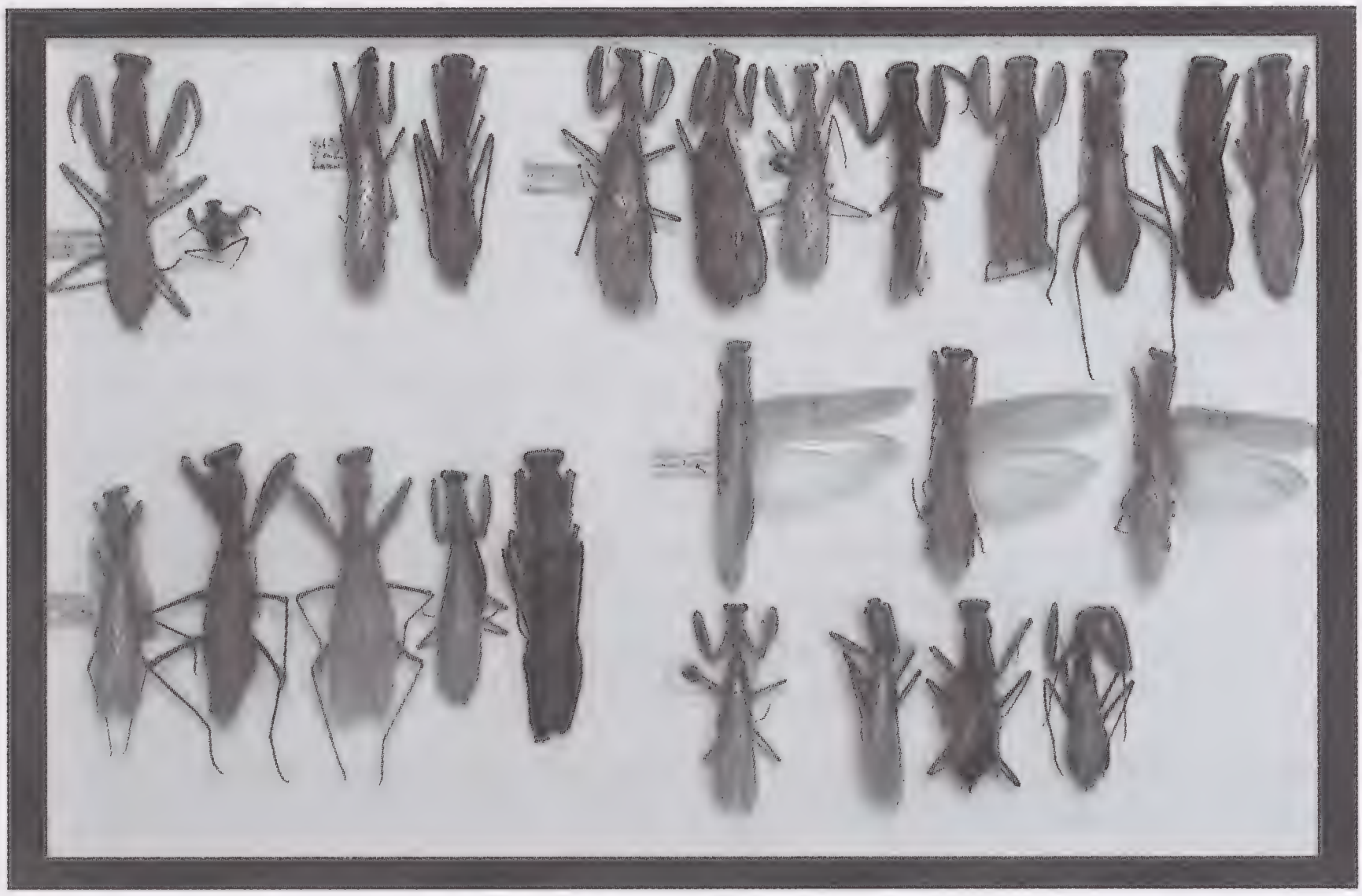

Fig. 1. *Sphodromantis viridis* (Forskal, 1775): box containing types and other specimens of: *S. v. viridis* (Forskal, 1775); *S. v. simplex* La Greca & Lombardo, 1987; *S. v. occidentalis* (Werner, 1906); *S. v. meridionalis* La Greca, 1950; *S. v. barbara* La Greca, 1967.

Fig. 2. Gen. *Eupholidoptera* Ramme, 1951: box containing types and other specimens of: *E. megastyla* (Ramme, 1939); *E. smyrnensis* (Brunner von Wattenwyl, 1882); *E. leucasi* F. Willemse, 1980; *E. danconai* La Greca, 1959; *E. cypria* Ramme, 1951; *E. garganica* La Greca, 1959; *E. hesperica* La Greca, 1959.

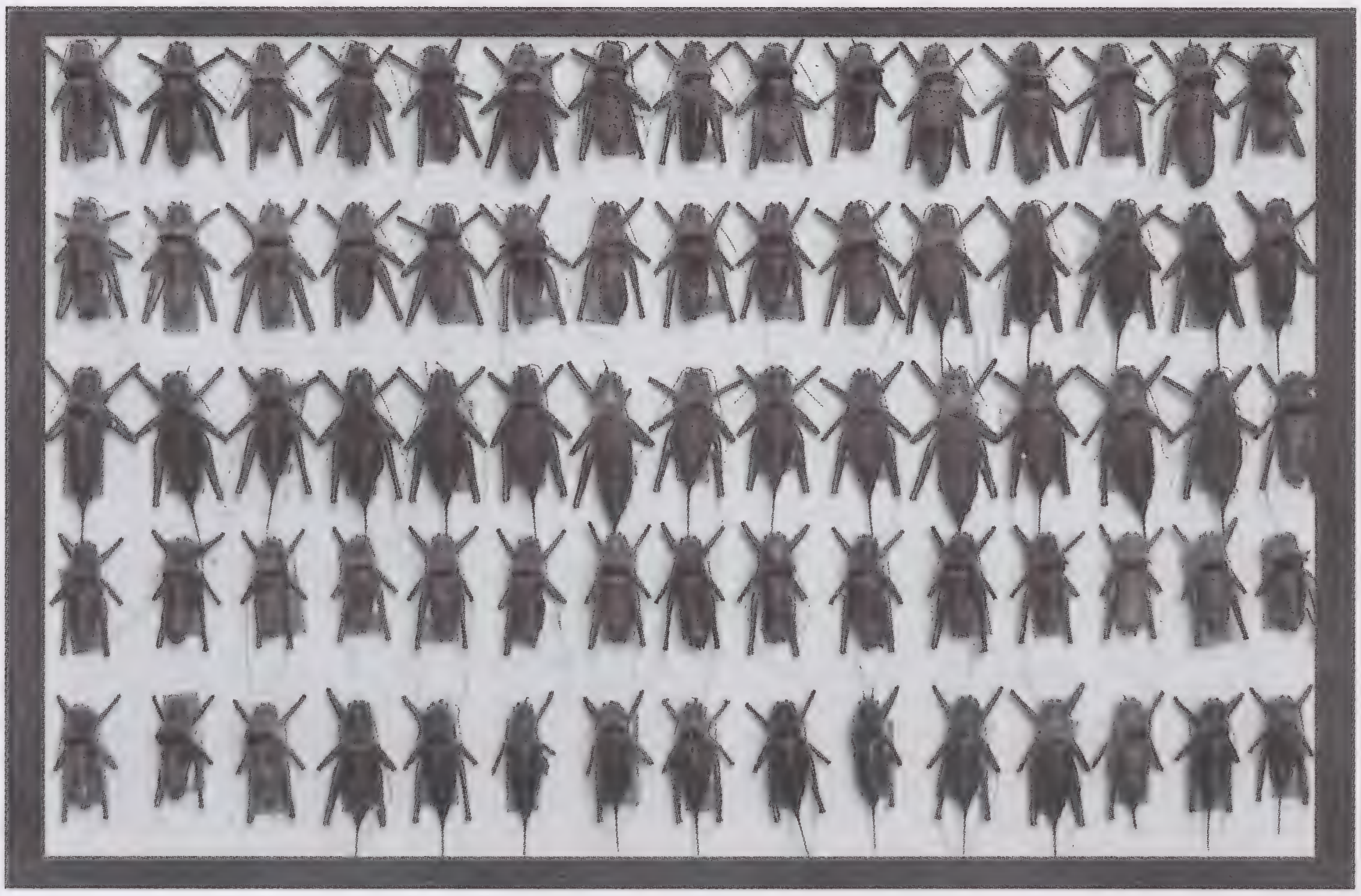

Fig. 3. *Uromenus riggioi* La Greca, 1964: box containing types and other specimens.

Fig. 4. *Italopodisma trapezoidalis* (La Greca, 1966): box containing types and other specimens of: *I. t. curvula* (La Greca, 1969); *I. t. trapezoidalis* (La Greca, 1966); *I. t. aprutiana* (La Greca, 1969).

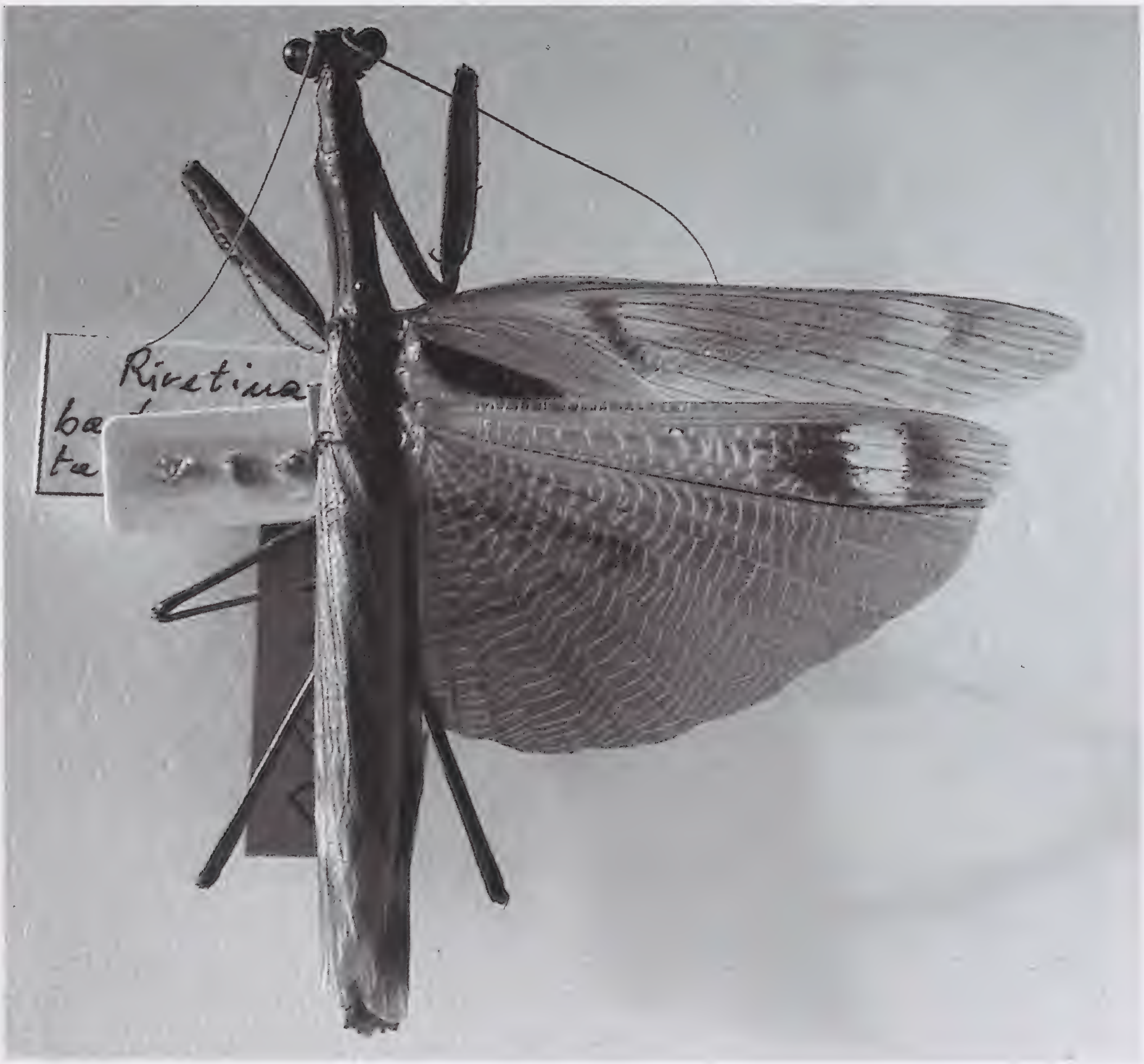

Fig. 5. *Rivetina baetica* ssp. *tenuidentata* La Greca & Lombardo, 1983, lectotype ♂: habitus in dorsal view.

Fig. 6. *Ephippiger apulus* ssp. *italicus* La Greca, 1959, lectotype ♂: habitus in lateral view.

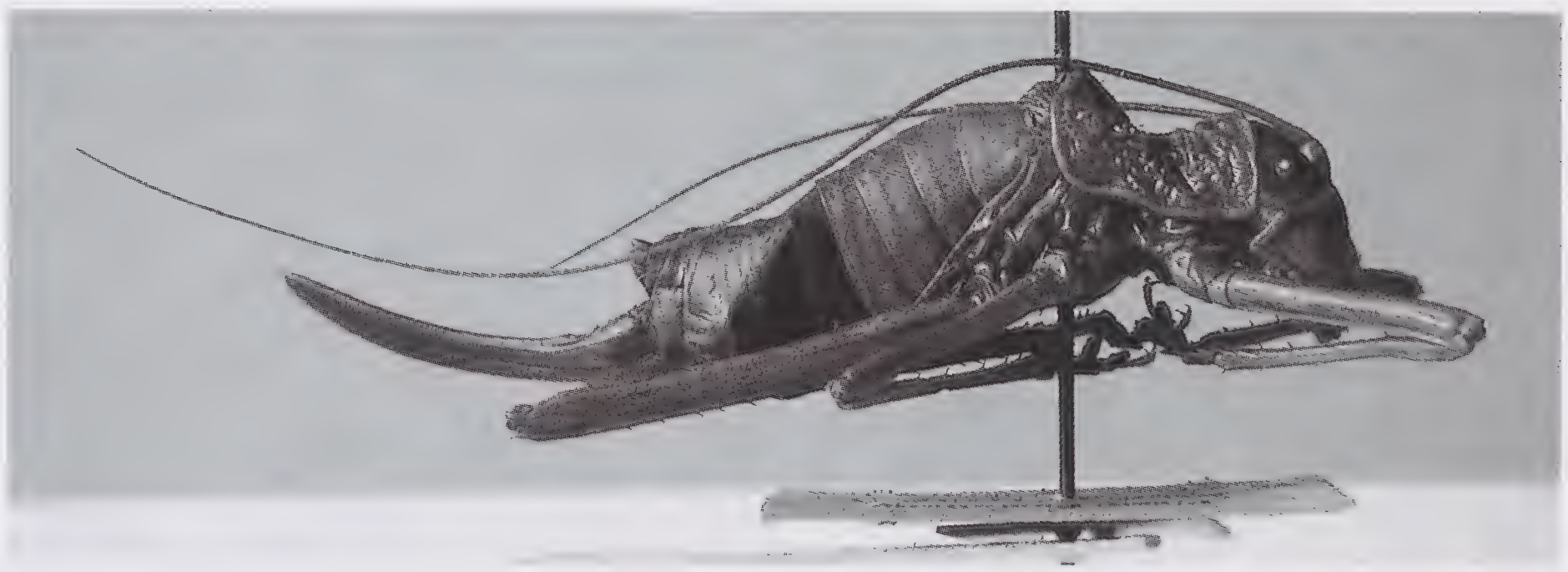

Fig. 7. *Bolivarius brevicollis* ssp. *trinacriae* (La Greca, 1964), lectotype ♀: habitus in lateral view.

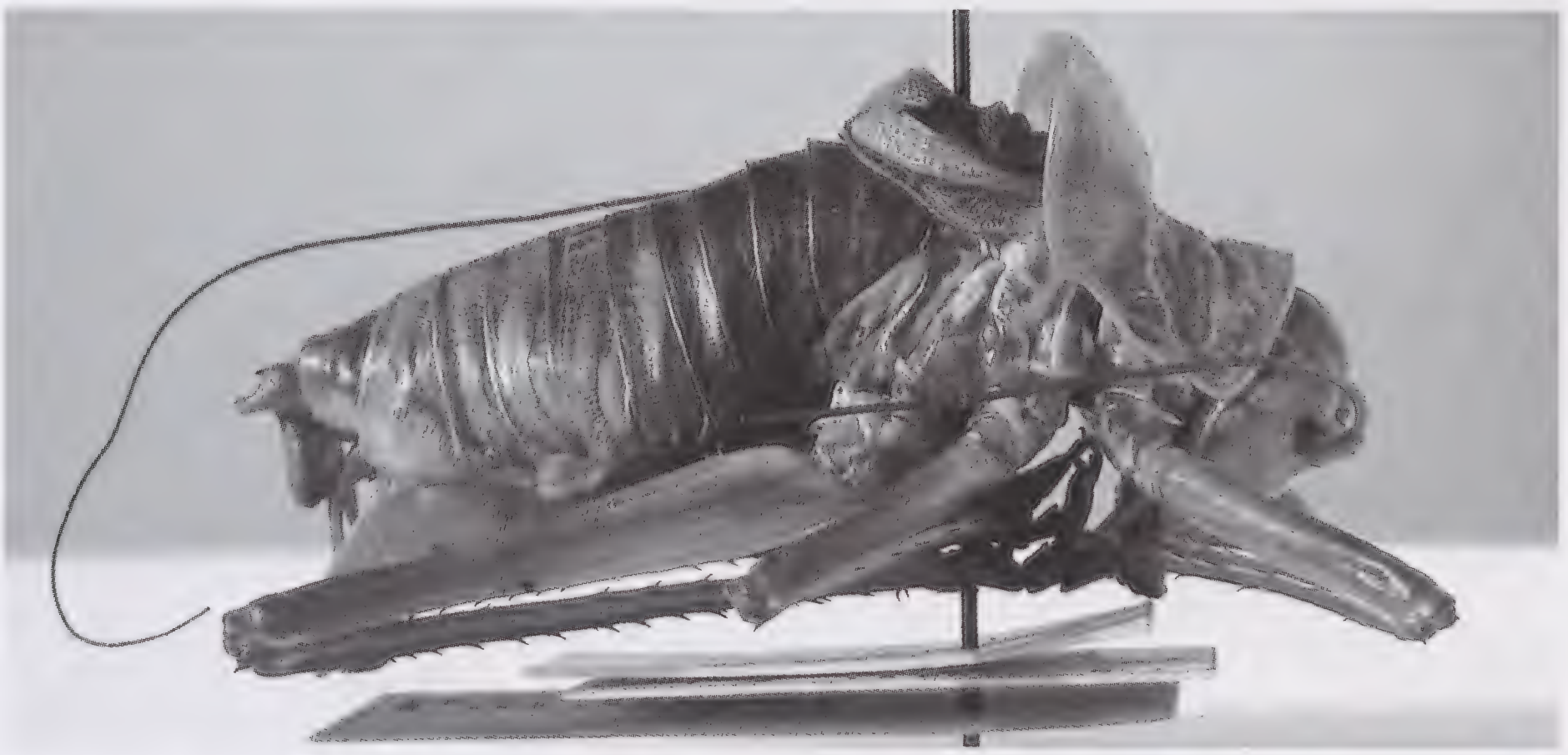

Fig. 8. *Uromenus riggioi* La Greca, 1964, lectotype ♂: habitus in lateral view.

Fig. 9. *Troglophilus andreinii* ssp. *hydruntinus* La Greca, 1961, lectotype ♂: habitus in lateral view.

Fig. 10. *Italopodisma acuminata* ssp. *marsicana* (La Greca, 1969), lectotype ♂: habitus in lateral view.

Fig. 11. *Italopodisma samnitica* (La Greca, 1954), lectotype ♂: habitus in lateral view.

Fig. 12. *Italopodisma trapezoidalis* ssp. *aprutiana* (La Greca, 1969), lectotype ♂: habitus in lateral view.

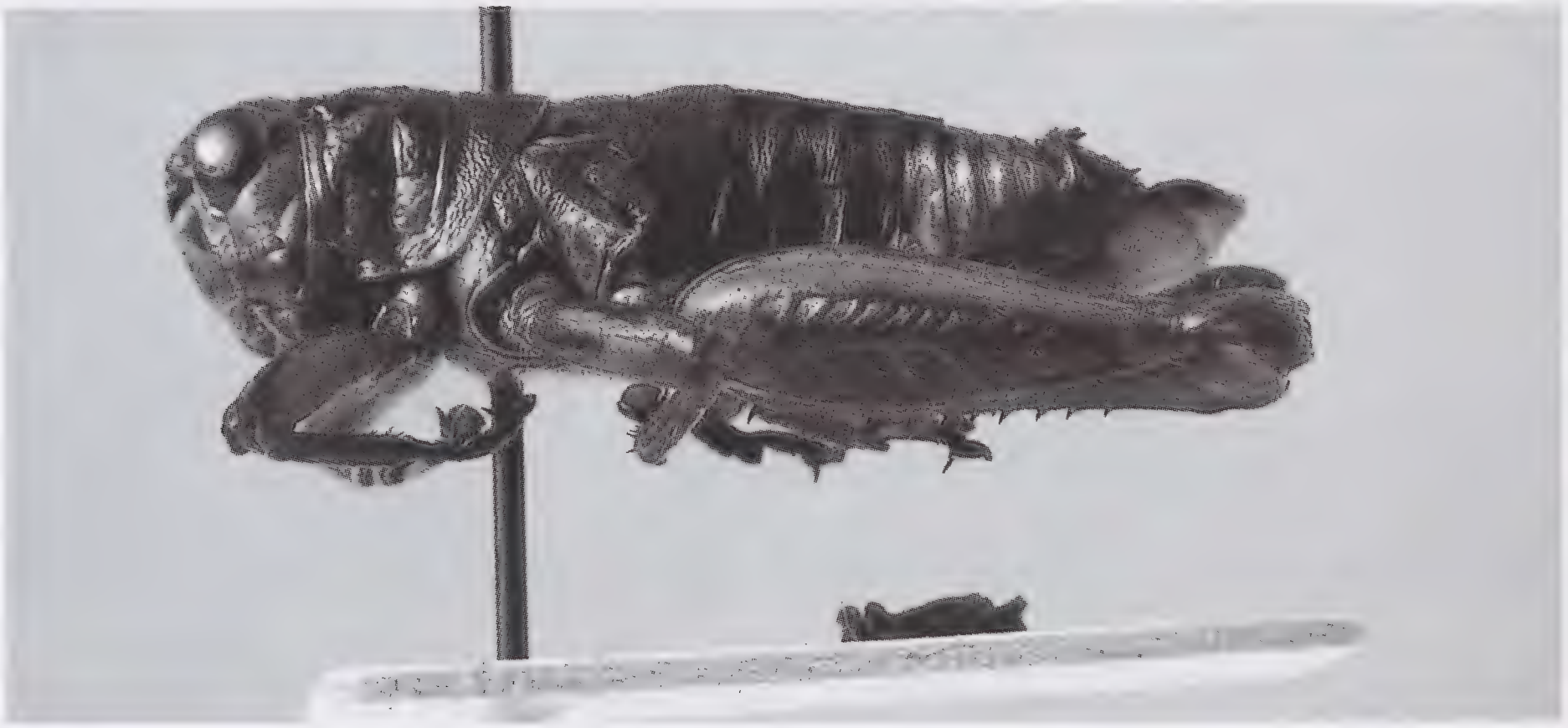

Fig. 13. *Italopodisma trapezoidalis* ssp. *curvula* (La Greca, 1969), lectotype ♂: habitus in lateral view.

Fig. 14. *Tropidopola graeca* ssp. *transjonica* La Greca, 1964, lectotype ♂: habitus in lateral view.

Fig. 15. *Dociostaurus minutus* La Greca, 1962, lectotype ♂: habitus in lateral view.

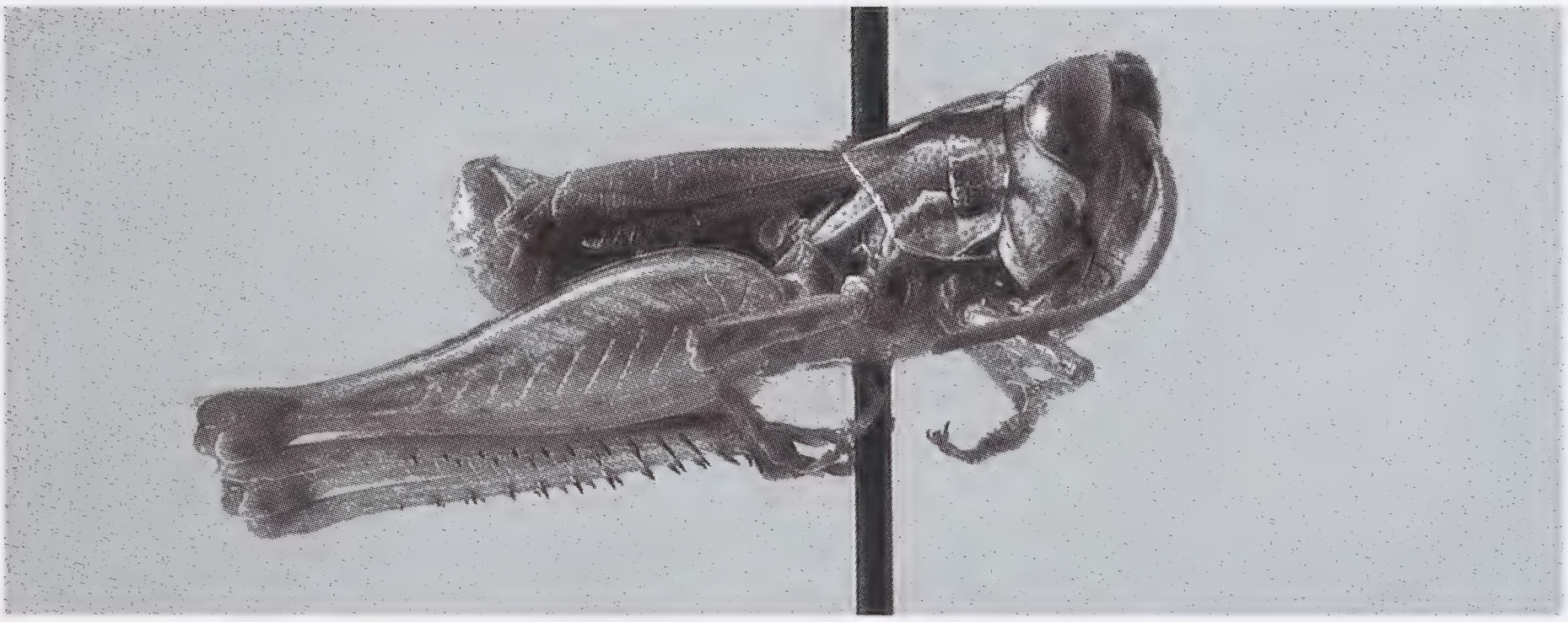

Fig. 16. *Dirshius lopadusae* (La Greca, 1973), lectotype ♂: habitus in lateral view.

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DORSA - A "Virtual Museum" of German Orthoptera Collections

Abstract - DORSA (German Orthoptera Collections) is a specimen based database with internet access to the Orthoptera held in German museum collections including geographic information on a world-wide basis as well as media data like illustrations of type specimens and sound recordings ("Virtual Museum"). A rapid assessment tool is developed for automated song recognition.

Riassunto - *DORSA, un "Museo Virtuale" delle collezioni di Ortotteri conservate in Germania.* DORSA (German Orthoptera Collections) è un data base con accesso via Internet, che consente di conoscere gli esemplari di Ortotteri conservati nei Musei tedeschi; esso include informazioni geografiche su base mondiale ed ulteriori dati, quali illustrazione dei tipi e registrazioni delle stridulazioni ("Museo Virtuale"). E' inoltre sviluppato uno strumento di rapido uso per il riconoscimento dei suoni.

Key words: Orthoptera, specimen database, type catalogue, photographic documentation, insect sounds, virtual museum, automated song recognition.

INTRODUCTION

The importance of digitised worldwide available data for the future development of taxonomy was just recently emphasized (Godfray 2002a, b). The Orthoptera are one of the few insect groups for which complete digital registers of valid taxa exist (Orthoptera Species File Online: http://OSF2.orthoptera.org/basic/HomePage.asp). Nevertheless, much of the information stored within museum collections is still not readily accessible, because most of it is not digitised (Lampe & Riede 2001).

DORSA (abbreviation for **D**eutsche **Or**thopteren-**Sa**mmlungen = German Orthoptera Collections http://www.dorsa.de) is part of EDIS, the Entomological Data and Information System (http://www.insects-online.de) launched by the German Federal Ministry of Education and Research. EDIS is intended to provide access to relevant information about insects and other arthropods for research and the general public and to promote digitisation of the data scattered over various entomological collections in Germany in a comprehensive database, the SYSTAX database at the University Ulm (http://www.biologie.uni-ulm.de/systax).

The aim of DORSA is the database access to important Orthoptera (grasshoppers, katydids and crickets) specimens in German research collections including multimedia information as pictures and sounds, and an internet-link to the global species database 'Orthoptera Species File' (OSF).

All information in DORSA is specimen based. It is thus possible to reproduce where single specimens have been collected, how they looked like, what was their stridula-

tion etc. DORSA is thus complementary to the Orthoptera Species File where the taxonomic background and general information on the species can be found.

In more detail, DORSA covers the following points:

1. REGISTRATION OF TYPE SPECIMENS. Registration of type specimens was done in the major German natural history museums that hold large Orthoptera collections (ZMHB Berlin, DEI Eberswalde, SMTD Dresden, ZSMH Hamburg, MLUH Halle, ZFMK Bonn, SMFD Frankfurt, SMNS Stuttgart, ZSM Munich). The Zoological Museum of the Humboldt-University Berlin houses by far the greatest number of Orthoptera types.

The aim of specimen registration is a type catalogue of the Orthoptera housed in German collections and to verify the corresponding information in the Orthoptera Species File Online (above) which is the taxonomic backbone for our database. Compiling the specimen information in the museums (Tab. 1) covered all primary types, most of the paratypes, additional specimens on which taxonomic revisions were based and voucher specimens for which sound recordings are available. We started with the information given in the Orthoptera Species File (OSF) [version April 2000] which contains information on primary types compiled from published data (presumption in Tab. 1). With this information we checked what is actually housed in the museum collections (museum data). It followed a validity check. In case of disagreement between the information in OSF and the actual museum data, it was necessary to consult the original publications. Finally the databases were updated as was done with the specimen information in the museums when necessary. After the validity check, the inventory data are imported into the all-biology database SYSTAX. In this database, interested users can find the specimen information together with specimen based multimedia data (images and sounds). Moreover, DORSA is linked on a species to species level with OSF2 thus that additional taxonomic information, synonyms, references, will be available by a link from DORSA to OSF, while when searching OSF it will be possible to find specimens and their media data in DORSA.

2. PHOTOGRAPHIC AND ACOUSTIC DOCUMENTATION. The aim is to create a "virtual museum" that documents the type specimens and helps to reduce the inquiries about and the loan of type material. Approximately 25000 photographs have been taken. Photographic documentation includes specimen labels, general habitus of the specimens, details of diagnostic characters, and also genital structures if this did not require manipulation of the specimens. The images are provided with size scales. All media data are linked to a specific specimen. Processing of the media data is time consuming. For most species, full documentation is already available in SYSTAX.

Sound recordings of Orthoptera were usually done by private researchers and were not previously compiled in a public sound archive. DORSA establishes the first comprehensive public sound library for Orthoptera sounds in Germany, and makes them available on the internet. More than 4000 recordings are so far compiled that are linked with known individual specimens. They were contributed by K.-G. Heller, S. Ingrisch, F. Nischk, K. Riede, and G.H. Schmidt; others will follow. The sound library is the base for the development of software for automatic song recognition.

Table 1. Registration of type specimens of Orthoptera without Tridactyloidea in German museum collections by December 2002. Collaborating museums: ZMHB Berlin, DEI Eberswalde, SMTD Dresden, ZSMH Hamburg, MLUH Halle, ZFMK Bonn, SMFD Frankfurt, SMNS Stuttgart, ZSM München.

	presumption	museum data					validity check				
museum	taxa with primary types in OSF*	taxa with primary types checked	taxa with types including paratypes	number of type specimens	total recorded species	total recorded specimens	type data in OSF not confirmed in museum	primary types lost: taxa	primary types not listed in OSF	no taxon entry found in OSF	unlabeled, newly recognized prim. types
Berlin	1093	1423	1725	3646	1937	4192	15		*330*	*68*	*12*
Eberswalde	45	79	136	325	177	386		1	34		
Dresden	66	117	170	521	290	878	6		55	10	7
Hamburg	142	135	260	435	314	549	5	55	43	1	
Halle	38	55	55	75	91	151	4		25	4	16
Bonn	6	44	48	152	50	156			12	13	
Frankfurt	82	151	176	332	263	540			69	5	1
Stuttgart	47	112	129	505	153	590			65	5	3
Munich	27	54	80	214	94	358		1	21	1	
Total	1546	2170	2779	6205	3369	7800	30	57	654	107	39

(*) OSF version of April 2000 at the beginning of the DORSA project. - italics = incomplete data.

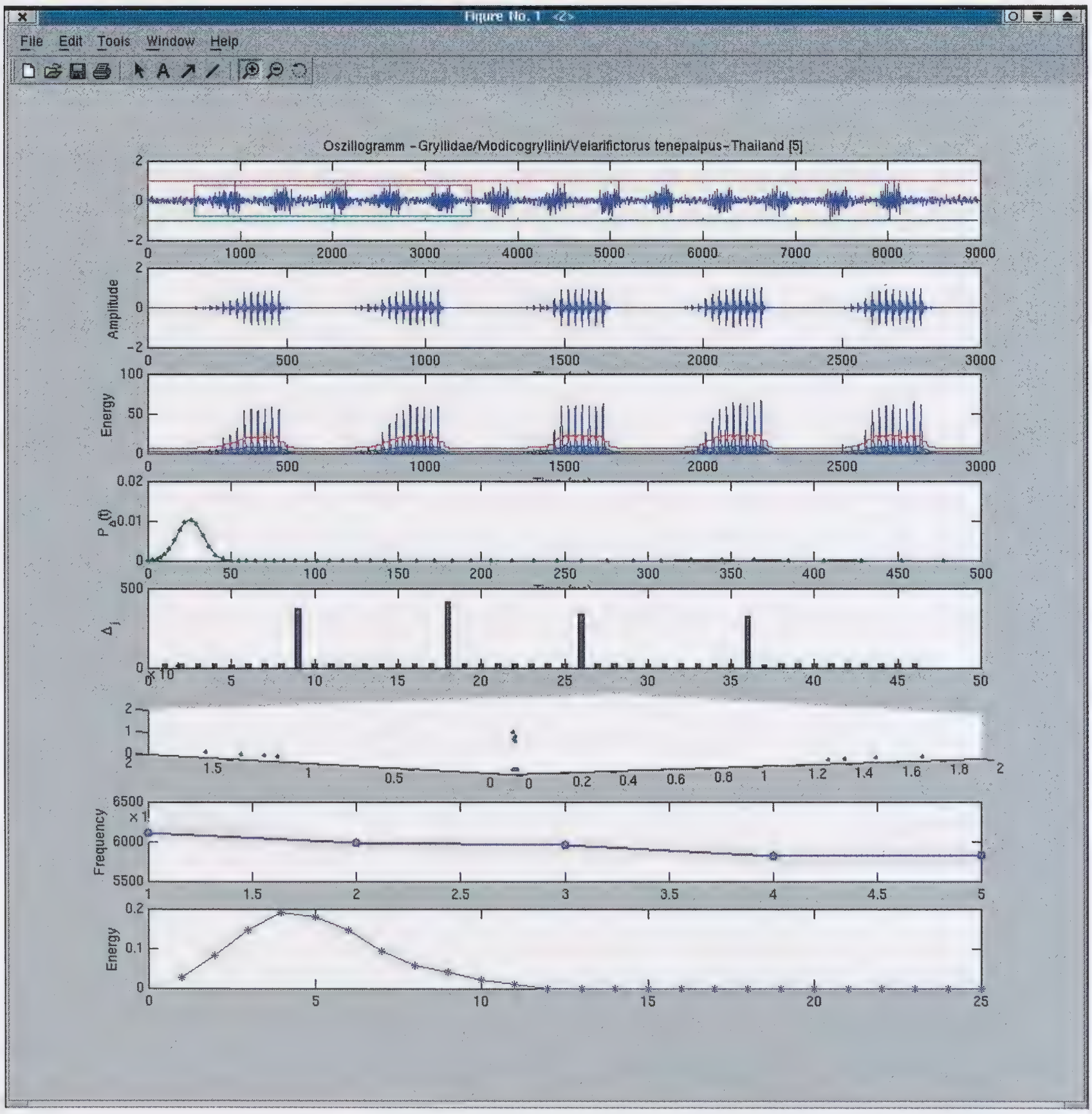

Fig. 1. Characters most suitable for the classification of cricket songs are the distances between pulses, the duration of pulses, and the frequency course within pulses. The feature vectors are classified individually and the results of the single classifiers are combined through classifier fusion.

3. AUTOMATIC SONG RECOGNITION. Based on the DORSA song database, a rapid assessment tool is developed for automated song recognition (Dietrich et al. 2002).

In principle, automatic song recognition in crickets (Grylloidea) and katydids (Tettigonioidea) follows the scheme:

1. pre-processing and filtering of the raw time signals (fig. 1),
2. segmentation of the filtered signals into single pulses (fig. 1),
3. extraction of typical features of pulses or pulse series,
4. automated classification in local time windows (fig. 2),
5. application of classifier fusion:
   a) to combine the classifier outputs of different features,
   b) for temporal fusion of classifier outputs (fig. 2).

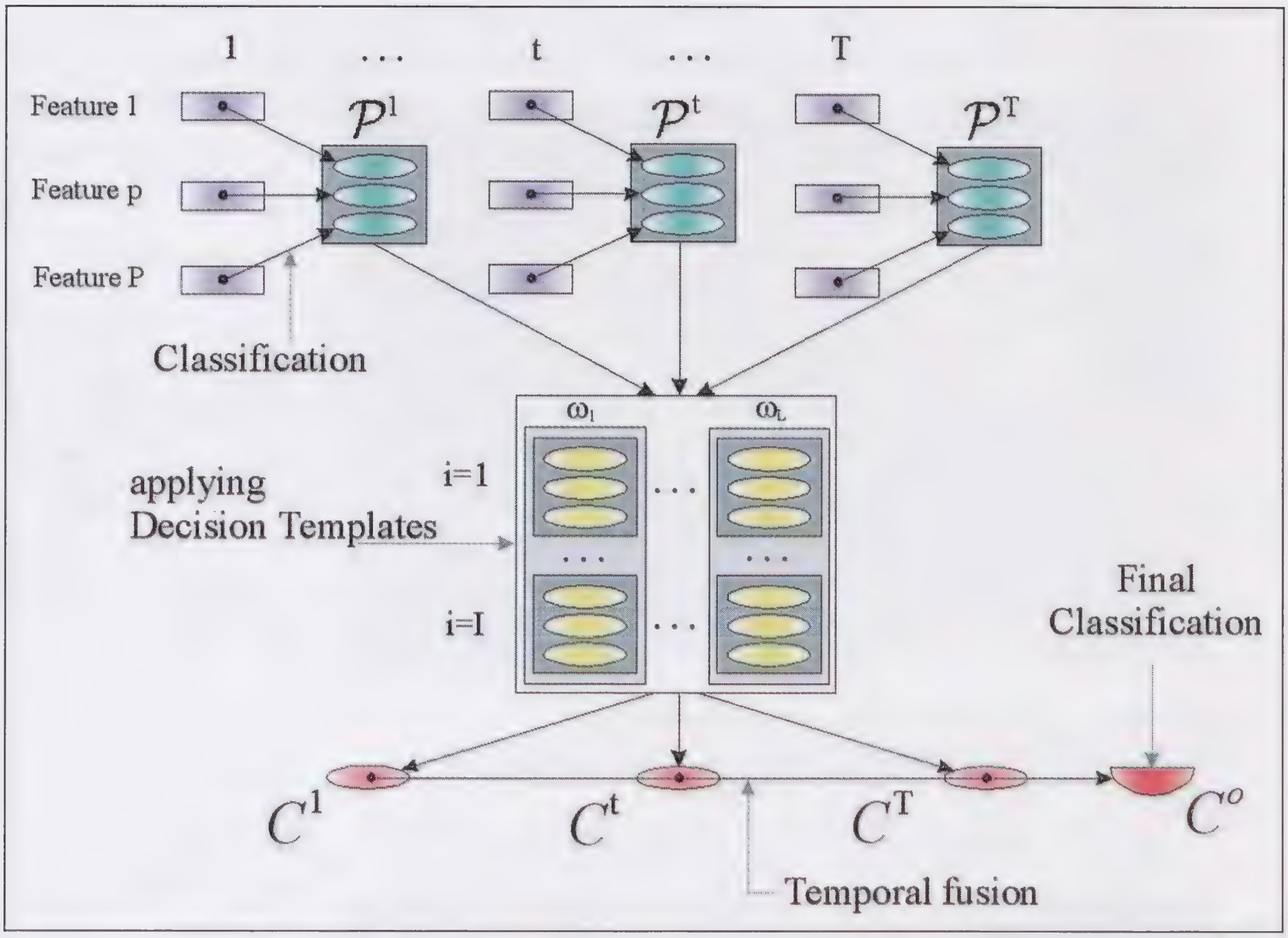

Fig. 2. Fusion of characters utilizing multiple decision templates (MDT).

To train the neural network architecture successfully a data set of known taxa is needed. For that as many as possible songs of different individuals of the same species should be used. At present the tool for the automatic sound recognition runs properly with a set of 215 songs from 137 individuals of 30 cricket species (details in Dietrich et al. 2001a, b, 2002).

4. GEOGRAPHIC INFORMATION. It is often difficult to find the exact locality for classical specimens as old types. The information given on labels may be either not precise or the names of places or their affiliation to countries has changed since the time of collection. Fortunately there are several expedition reports to allow tracing the localities with sufficient precision. For all specimens with the locality information sufficiently reliable, we geo-referenced the collection sites with latitude/longitude co-ordinates. This will help future users to find this information easily, and it allows mapping by a geographical information system (GIS). In the GIS the distribution of specimens or taxa can be overlaid with additional information such as environmental data.

A web-based GIS mapping tool is already available at our homepage (http://www.dorsa.de > link: News > DORSA-interactive map server). It is based on approximately 2,000 localities of katydid (Tettigonioidea) sound records made by K.-G. Heller. The interface allows geographic queries, retrieval and mapping of species data.

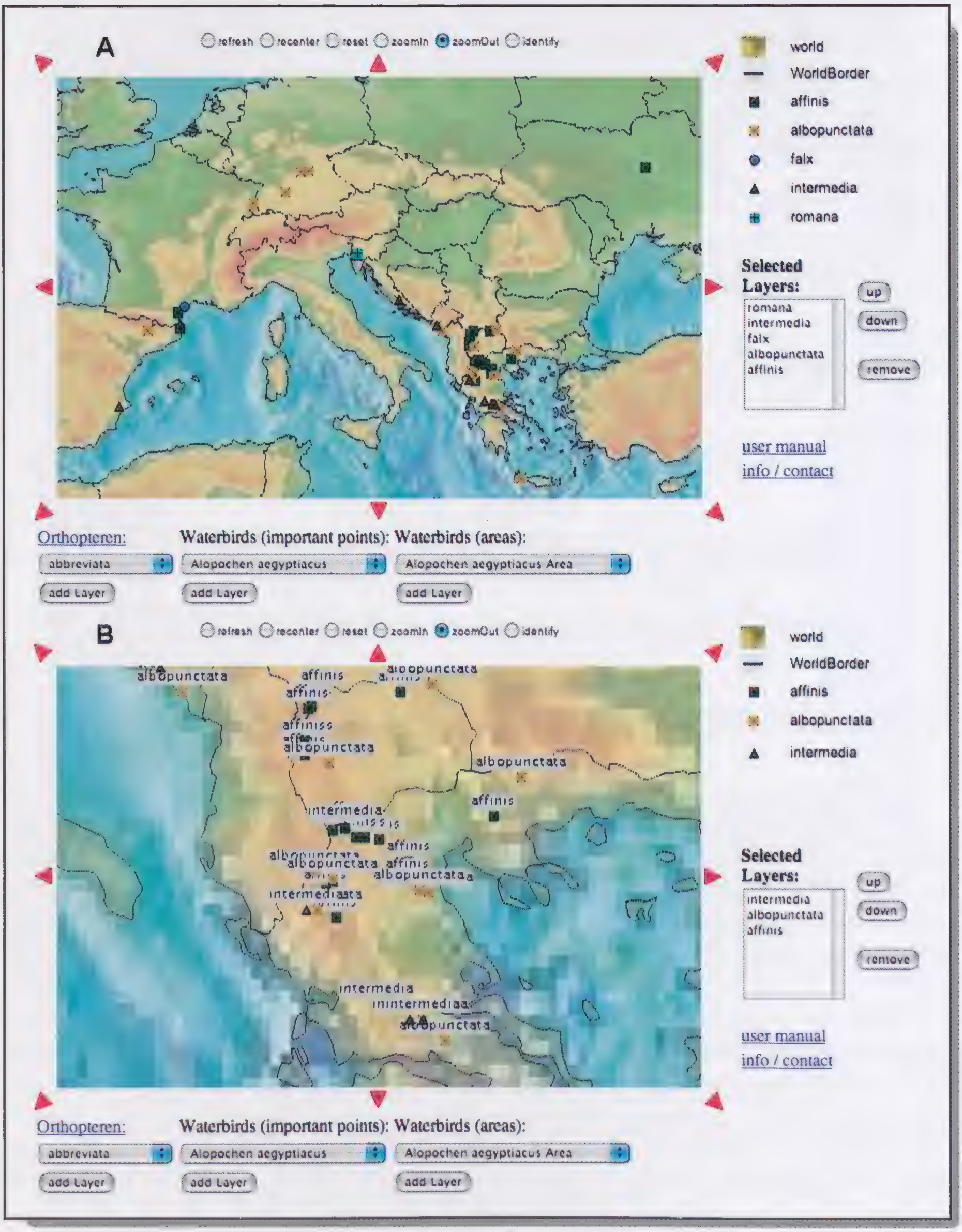

Fig. 3. GIS analysis with geographical coordinates from the DORSA database. Interface of the DORSA-interactive map server showing a map of collection sites of voucher specimens for sound recordings by K.-G. Heller using *Platycleis* s. str. as an example.
A: Map with specimen data from 5 species on a European scale. Each species is shown with a different symbol.
B: On a map zoomed to regional scale, individual points are attributed with the species names.

With this map server, either a single or several species can be selected; after refreshing the map, the localities of the specimens in the database are drawn on the map (fig. 3A). The map can be zoomed from worldwide to local level. At local level, localities are labelled with species names thus easily allowing to compare the localities of different taxa (fig. 3B).

Note added in proof

The actual numbers of digitised specimens and multimedia data can be found on the DORSA homepage http://www.dorsa.de

Meanwhile all specimen data are included in the SYSTAX database http//www.biologie.uni-ulm.de/systax and fully linked with the Orthoptera Species File Online: http://OSF2.orthoptera.org/basic/HomePage.asp

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Battal ÇIPLAK

Biogeography of Anatolia: the marker group Orthoptera

Abstract - Orthoptera are used as a marker group in order to define biogeography of Anatolia. Some distribution patterns among them, possibly reflecting the tectonic and climatological changes in Anatolia, are presented. Species in the genera *Eupholidoptera* and *Poecilimon* are assumed to be derivatives of some stocks present in the Miocene in Aegean Plate. It is possible that rapid radiation in Anatolian Orthoptera occurred recently in the Pliocene and Pleistocene, especially under effects of the glacial periods. This is particularly supported by distribution of the genera *Poecilimon*, *Psorodonotus* and *Parapholidoptera*. In addition, distributions of *Parapholidoptera*, *Psorodonotus* and *Chorthippus (*species belonging to *demokidovi* group) show that faunal communication between east Anatolia/Caucasus and the Balkans occurred via mountain ranges over southern Anatolia.

Riassunto - *Biogeografia dell'Anatolia: significatività dello studio degli Ortotteri.*
Gli Ortotteri possono essere utilizzati come gruppo sistematico idoneo per definire la biogeografia dell'Anatolia. L'autore presenta alcuni modelli di distribuzione che testimonierebbero i cambiamenti tettonici e climatici dell'Anatolia. Si ritiene ad esempio che specie dei generi *Eupholidoptera* e *Poecilimon* si siano evolute da gruppi originariamente viventi nella Placca Egeide nel Miocene. E' possibile che la rapida radiazione evolutiva degli Ortotteri anatolici sia avvenuta recentemente, nel Pliocene e nel Pleistocene, in particolare a causa dell'effetto dei periodi glaciali. Questa ipotesi è particolarmente supportata dall'attuale distribuzione dei generi *Poecilimon*, *Psorodonotus* e *Parapholidoptera*. Inoltre la distribuzione di *Parapholidoptera*, *Psorodonotus* e *Chorthippus* (specie appartenenti al gruppo *demokidovi*) mostrano che attraverso le aree montane dell'Anatolia meridionale hanno avuto luogo consistenti relazioni faunistiche tra l'Anatolia orientale/Caucaso ed i Balcani.

Key Words: Anatolia, Orthoptera, Neogene, glacial periods, biodiversity, biogeography.

INTRODUCTION

Anatolia is a land bridge for distribution of faunal elements from eastern to western and from northern to southern part of Palaearctic region (Kosswig, 1955; Demirsoy, 1999; Çıplak, 2003). From a zoogeographical perspective, it includes Levant, western Iran and northern Iraq, in addition to Asian Turkey (Kosswig, 1955; De Jong, 1998); this definition does not overlap with phytogeographical region-subregion division of Anatolia (Davis, 1965; Zohary, 1973). It provides a natural pathway for faunal interchanges between Eurasia and Africa (in particular Arabian Peninsula and North Africa). Kosswig (1955) mentioned that there are no clear faunistic boundaries for distribution of animals thruogh Anatolia, but actually a more or less gradual transition from one faunistic region to the other. Uvarov (1921), followed by Demirsoy (1977, 1999), recognised three groups among Anatolia Orthoptera: the Angarian, the Mediterranean and the Eremian. Recently, Anatolia has been defined as an important endemism area both for animals (Ooesterbroek & Arntzen, 1992; Çıplak & Demirsoy, 1995, 1996; De Jong, 1998; Çıplak, 2003) and plants (Médail & Quézél,

1999). Besides, the general area cladograms by Ooesterbroek & Arntzen (1992) and De Jong (1998) show Anatolia to be a basal branch leading to west Mediterranean plus Central and East Mediterranean, excluding Iberia and Italy.

Biogeographical evaluations require knowledge on geological history and present geography (topography and climate) of the concerned area, and on taxonomy and evolution of the subjected taxa. There are few phylogenetic studies on the Orthoptera taxa, mainly distributed in Anatolia (e.g. Çıplak, 2000), and some biogeographical accounts were presented on the basis of some lineages. La Greca (1999a) defined the Godwanian components of Anatolian fauna mainly on the basis of subfamilies or tribes. Demirsoy (1999) presented some assumptions about distribution and speciation of Pamphaginae under effects of glacial periods. Çıplak et al. (1993) assumed that the Anatolian Diagonal belt has been an active barrier for many taxa. The endemic Anatolian Orthoptera species were presented by Çıplak & Demirsoy (1995, 1996), and the distribution of Tettigoniinae in Turkey has been presented by Çıplak (2003) with some considerations about biodiversity and conservation in Anatolia.

However, there are still many unknown aspects of Anatolian biogeography, especially the background patterns that actually could explain the rich biodiversity in this rather isolated peninsula. Which group of animals can be used as markers to explain the biogeographic patterns in Anatolia? Can faunal boundaries or gliding transitions be defined? Which is the most effective factor to produce such a rich biodiversity?

BRIEF OVERVIEW ON GEOLOGICAL EVOLUTION OF ANATOLIA. The section provides a brief overview of on palaeogeography of Anatolia and related areas (the derivatives of Aegean plate: the so called Aegeid, Apulia, Eurasian-Turkish plate, the Irano-Anatolian plate and others). This overview is based primarily on the studies by Hsü (1978), Steininger & Rögl (1984), Tchernov (1992), Demirsoy (1999), La Greca (1999a, 1999b) and Rögl (1999).

The tectonic evolution of the Aegeid plate is related with that of Tethys sea that separated Laurasian and Godwanian mother continents. It is assumed that the Aegeid plate derived from a tectonic detachment from the north of Africa in the Cretaceous. The Aegeid was an island/archipelago during the Paleocene-Eocene moving towards north-eastern direction in the Tethys sea. The major tectonic changes around this plate took place since Late Oligocene, particularly during Neogene, when a continental collision occurred between India and Asia and later between Africa and Eurasia (fig. 1A). The collision of Africa with Eurasia gave rise to the Alps, the Dinaric and the Hellenic Mountains of Yugoslavia, Albania and Greece and the Taurus mountain ranges of Turkey. The movements along Alpine-Himalayan tectonic belt resulted in a new configuration of continents and ocean in and around Tethys. Transregressive and regressive cycles of these periods provided faunal communications between Aegean plate and continental Europe, and between Farsian plate and Africa for several times during the whole Miocene.

It was supposed the existence of a continental area stretching from Yugoslavia to Turkey, between Eastern Mediterranean and Paratethys in Chattian (fig. 2). In the Early Miocene, at the time of the collision with Africa, which gave place to the seaway between Indian Ocean and Tethys, Aagean plate got connected to Farsian plate (fig. 3). Later, during Langhian, this plate lost its eastern connections and became a fully isolated island, a

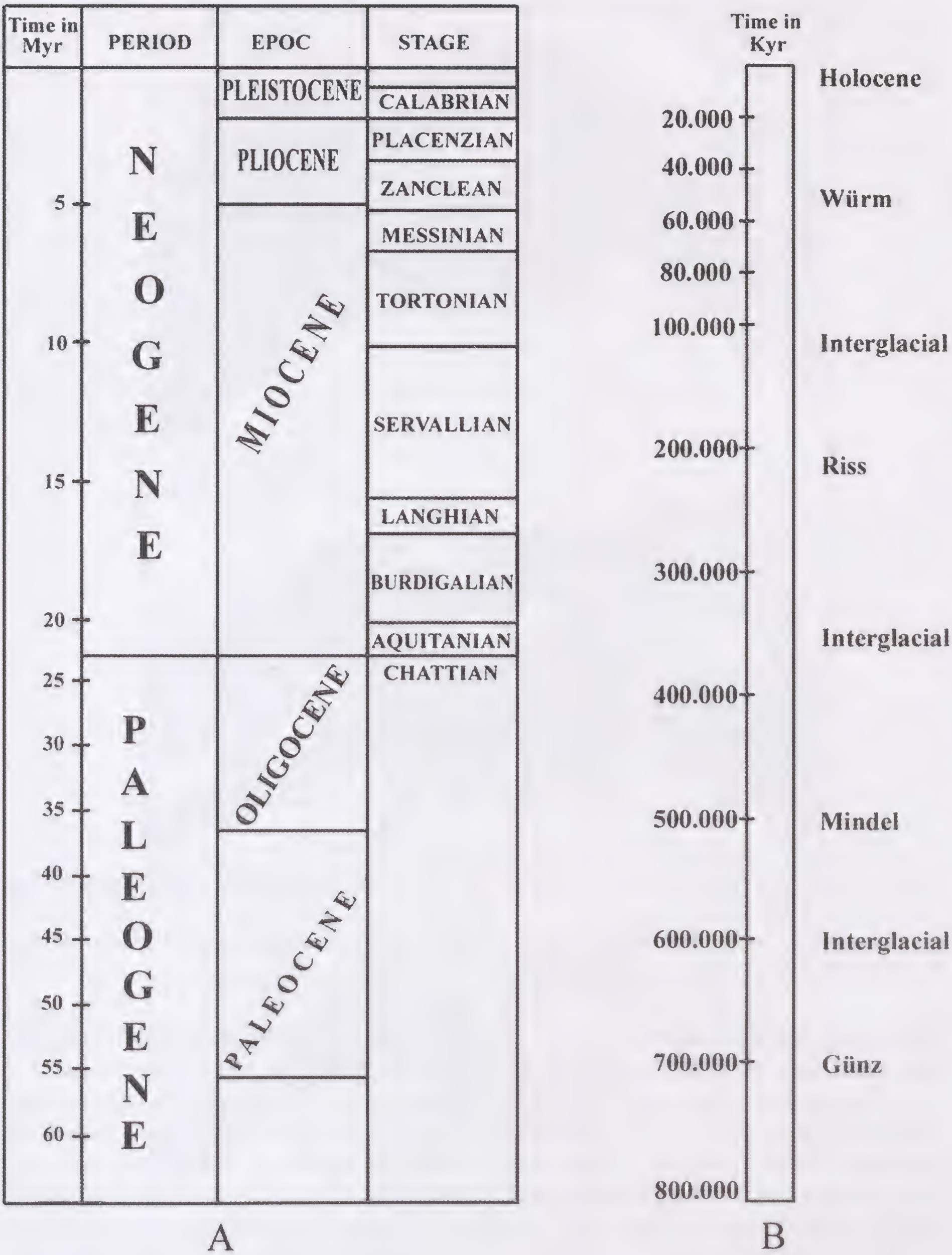

Fig. 1- Geological time table, A) Cenozoic, B) Last four glacial periods in the Quaternary.

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Fig. 2 - Land-sea configuration around Eastern Mediterranean in Late Oligocene (modified from Steininger & Rögl, 1984).

Fig. 3 - Land-sea configuration around Eastern Mediterranean in Early Miocene (modified from Steininger & Rögl, 1984).

land-sea configuration similar to the one from Late Oligocene (fig. 4). However, Aegean plate regained contacts with continental Europe in Serravallian.

The rotational and compressional movements of the Late Miocene brought to two important results (fig. 5). First: the movement of Arabian plate closed the marine connections towards East, and Farsian plate covered the site of the Mesopotamian, thus resulting in a stable land corridor. Second: the Aegean basin became a sea, dividing Aegean plate into two small plates, Anatolia and Greece plus some parts of the Balkans. This event probably led to independent differentiation of vicariant Aegean stocks in Anatolia and Greece, and it should be considered one of the most important events in evaluating biogeography of regions derived from Aegean plate. However, the closing of the Gibraltar in Messinian led to a partial desiccation of the Mediterranean that provided terrestrial corridors between Greece and Anatolia once again (fig. 6). These corridors

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Fig. 4- Land-sea configuration around Eastern Mediterranean in Middle Miocene (modified from Steininger & Rögl, 1984).
Fig. 5- Land-sea configuration around Eastern Mediterranean in Late Miocene (Tortonnian - Pannonian) (modified from Steininger & Rögl, 1984).
Fig. 6- Land-sea configuration around Eastern Mediterranean during desiccation in Late Miocene (Messinian - LatePantian) (modified from Steininger & Rögl, 1984).

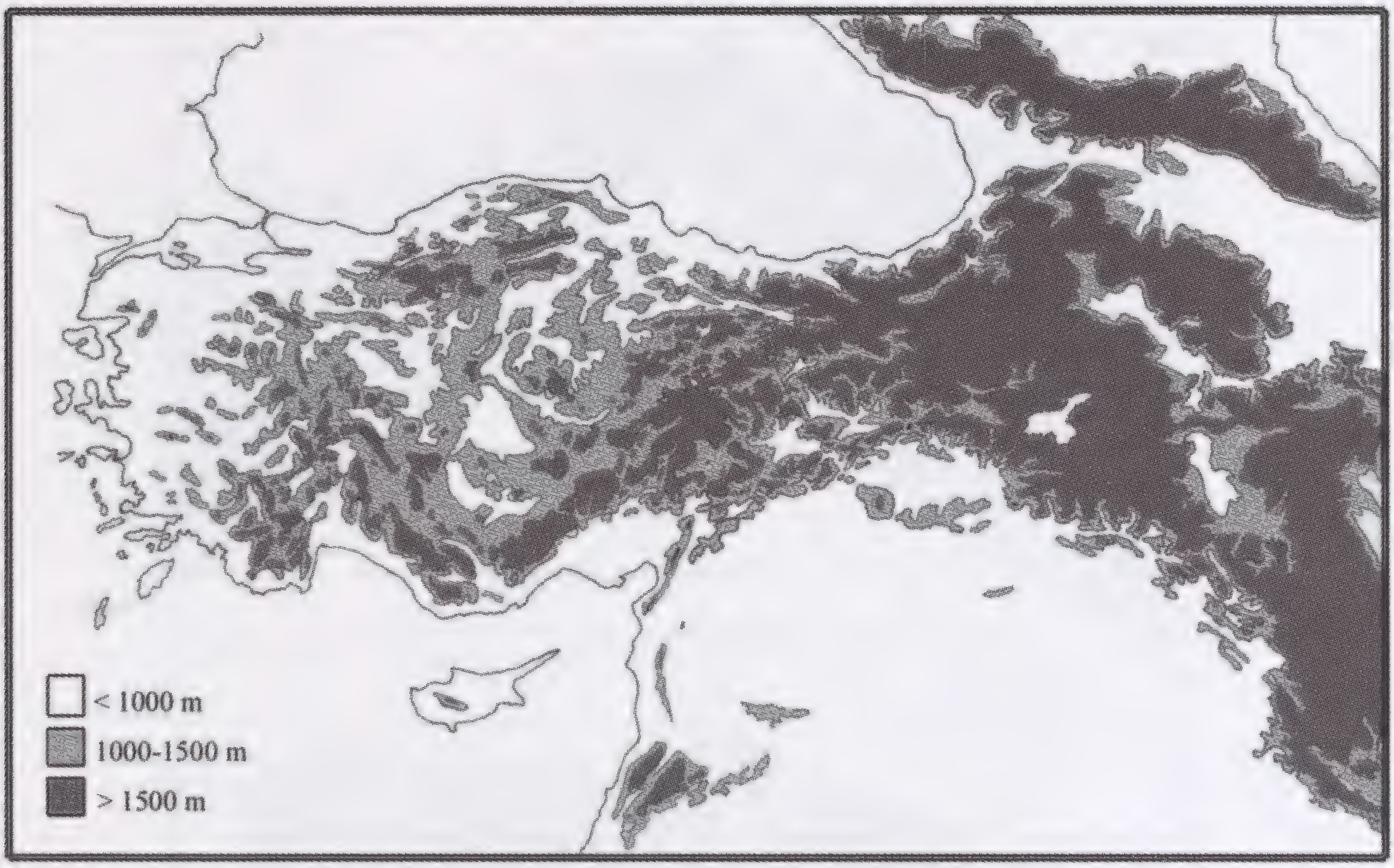


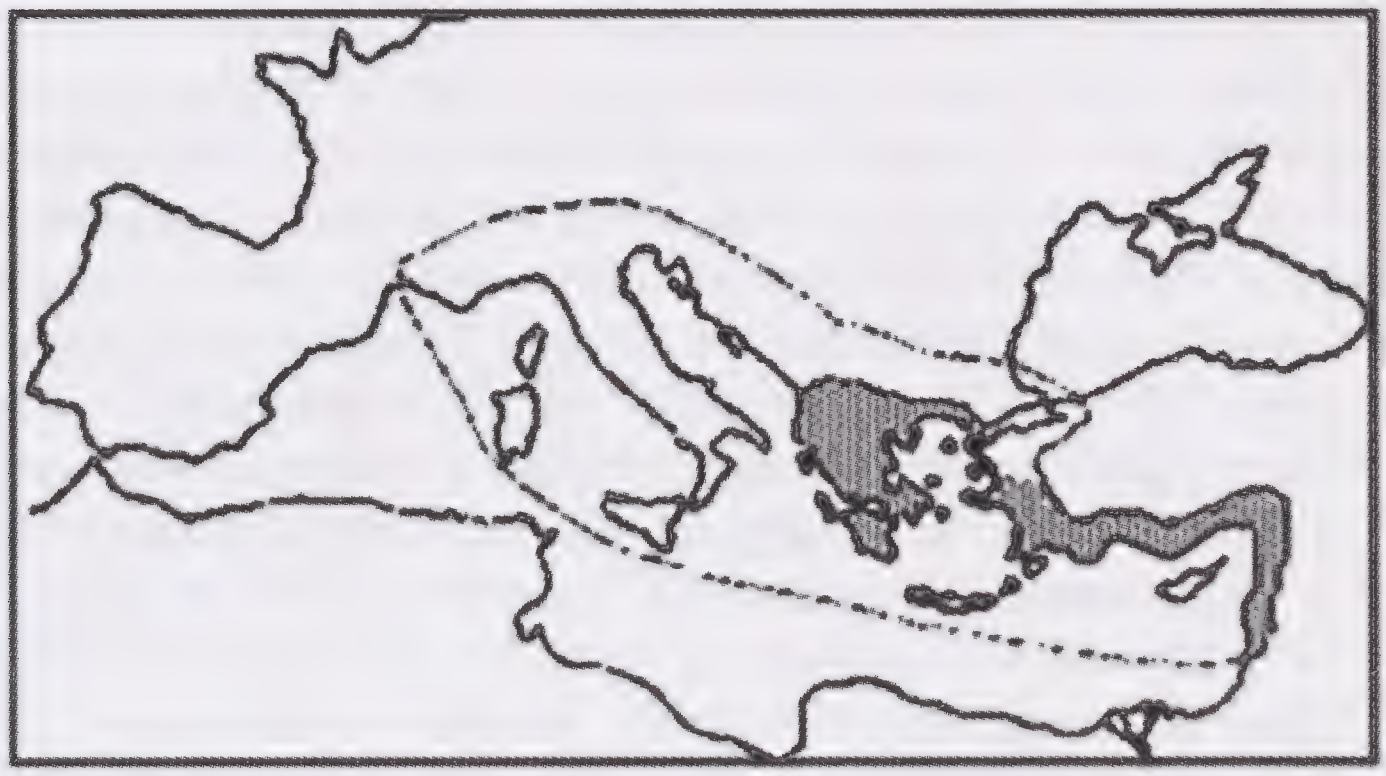
Fig. 7- Present topography of Anatolia (light grey areas represent 1000-1500 m elevations; dark grey areas represent the elevations higher than 1500 m).

created possibilities for faunal exchanges between the two sister plates, Anatolia and Greece. The reflooding of Mediterranean in Pliocene brought more or less to the present land-sea configuration. Probably, reflooding of the Aegean Sea in this period caused isolated vicariant populations on Aegean islands.

As some authors reported, sixteen glacial periods occurred during last 2.4 million years in Pliocene and Pleistocene (Webb & Bartlein, 1992; Hewitt, 1996, 2000). Probably the last four glacial periods in Pleistocene (fig. 1B) had the greatest impact on faunal composition of Anatolia and related areas. Anatolia was an important refugium, holding populations during glacial periods, that could move from there during interglacials, via Thracia and the Caucasus. Besides, fluctuations in the temperature during these periods pushed the old Anatolian populations from the South to the North and in the opposite direction repetitively (Çıplak, 2003). Topography of Anatolia (fig. 7) possibly provided some additional effects on changes in distributions.

Distribution patterns among Anatolian Orthoptera

Order Orhoptera is a relatively well known group of the Anatolian fauna. Besides, it is used as a marker group in biogeography of the Turkey (Uvarov, 1921; Çıplak et. al., 1993; Demirsoy, 1999; La Greca, 1999a, 1999b; Çıplak, 2003). So, there should be some clues in the present distribution of some lineages about tectonic and climatologic evolution of Anatolia. In this paper, distributions of some Anatolian Orthoptera, possibly derived



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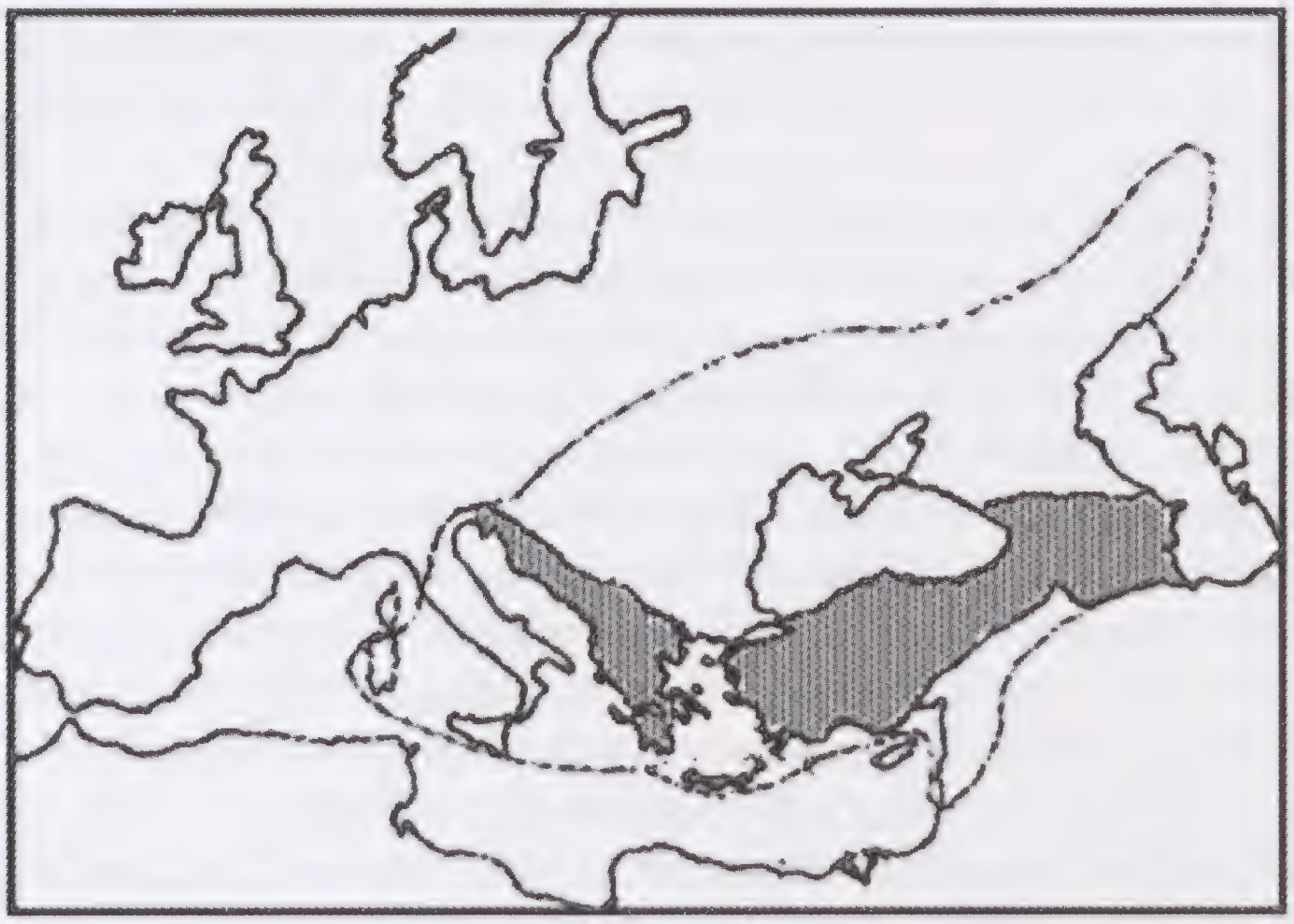

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Fig. 8 - Distribution of the genus *Eupholidoptera* (doted areas represent higher species number).
Fig. 9 - Distribution of the genus *Poecilimon* (doted areas represented higher species number) (Modified from La Greca, 1999a).

from some stocks in the Aegean plate during the Neogene, will be pointed out. Later, a definition will be given about of a possible distribution corridor, considered as functional during glacial periods between Europe and the Caucasus over southern Anatolia, for the animals preferred cold climate and alpine vegetation. Also, these distributions and biodiversity in Anatolia will be correlated with ice ages.

EUPHOLIDOPTERA: A POSSIBLE MIOCENEAN ORIGIN AND ITS SUBSEQUENT EVOLUTION. Pholidopterini (sensu Ramme, 1951) include five genera; *Pholidoptera* Wesmael, *Parapholidoptera* Mařan, *Eupholidoptera* Mařan, *Apholidoptera* Mařan and *Uvarovistia* Mařan (Mařan, 1953). Of these five genera, the last four are closely related (Rentz & Col-

less, 1990; Çıplak, 2000). *Pholidoptera* occurs in central and northern Europe including whole Black Sea basin. The range of the other genera covers Mediterranean basin excluding north Africa and Iberia, the Caucasus, western Iran and northern Iraq. *Apholidoptera* (two species) is diffused in northern Iraq, western Iran and eastern Anatolia up to Anatolian Diagonal belt (Çıplak et al., 1993) in the west. *Uvarovistia* (five species) is sympatric with *Apholidoptera*, but is also present in the Caucasus and Levant (Çıplak, 2003; Katbeh Bader & Massa, 2001).

Eupholidoptera is a typical Mediterranean genus including more than fifty species mostly associated with maquis vegetation along coastal regions. Its range extends from southern France, in the west, to Jordan / Israel, in the east (fig. 8). However, the genus is concentrated in Greece and Turkey. There are twenty-two species recorded from Greece and Aegean islands (Ramme, 1951; Harz, 1969; Willemse & Kruseman, 1976; Heller et al., 1998; Willemse, 1980, 1984, 1985; Heller, 1988; Willemse & Heller, 2001). The genus is represented with one species in France (also in Corsica) and Switzerland, with seven species in Italy and with two species in Bulgaria. Even though, all of these are closely related, and most of them were previously recognised as subspecies of *Eupholidoptera chabrieri* (Charpentier), Massa (1999) treated them as separate species. Besides, some of these species (subspecies) were also recorded from Greece. However, it is quite probable that they represent a recent spreading from Greece or the Balkans. Of the fifty-one species of the genus, twenty were recorded from Turkey (Ramme, 1951; Karabağ, 1958; Salman, 1983; Çıplak et al., 1993, 1999). Additionally, five species are recorded from Levant and one from Cyprus (this last also represented in Anatolia) (Ramme, 1951; Harz, 1969; Kaltenbach, 1974; Ayal et al., 1999; Katbeh Bader & Massa, 2001). Most of the species of *Eupholidoptera* show a very restricted distribution, and sometimes they are known just from their type localities. For example, seventeen of the Greek species are endemic, ten of which are known only from Crete and other four only from other adjoining islands (Willemse & Heller, 2001). Also, nineteen species are found in Aegean and Mediterranean coastal regions of Turkey, mostly in or around type localities.

Current range of the genus is restricted, ecologically speaking, to a Mediterranean type vegetation and climate. However, no species of the genus have been recorded in the Iberian Peninsula, northern Africa or large parts of the Black Sea coast (except Balkans), even though some of these areas have quite similar climate and vegetation, but there are many representatives of the genus on the Aegean islands, that are separated by distinct barriers from mainland Europe and Anatolia. Thus, environmental requirements are not the only factors that determined the distribution of the genus.

The palaeobiogeography of the genus can be strictly correlated with the tectonic evolution of the eastern Mediterranean. As previously assumed, since most of the species are allopatric, the spreading could have occurred mainly by vicariance rather than by dispersal. Additionally, the present distribution of the genus is almost restricted to the regions derived from the Aegeid plate, especially in the Mediterranean part. This is probably due to the fact that the genus went throughout a parallel evolution with that of its distribution area in eastern Mediterranean.

There were many transgressive and regressive cycles of the Neogene Mediterranean and Paratethys during the Oligocene-Pleistocene (Steininger & Rögl, 1984). The area that

now constitutes the range of *Eupholidoptera*, called the Aegeid plate, was fully isolated from all other continental plates, being twice surrounded by Paratethys: the first time during the late Oligocene (25-23 Myr BP) and the second during the middle Miocene (16.8-16 Myr BP) (Steininger & Rögl, 1984). Therefore, it can be postulated that the ancestor of the genus arose during one of these events, as the current range of the genus corresponds with the area isolated during each of these eras. However, because there was a connection between the Aegeid and the Farsian plates during the early Miocene and there is no species of the genus in Iran, Iraq and adjacent parts, the second isolation of this plate during the middle Miocene seems to be the more plausible chance for the origin of the genus. This proposal also explains why there are representatives of the genus recorded from Balkans: in fact it has been suggested that the Balkans originated from the Aegeid plate (La Greca, 1999b). Besides, early Miocene may be the time of separation of the closely related genera *Uvarovistia* and *Apholidoptera* that are distributed in Iran, Iraq, Armenia and eastern Turkey (the distribution of the genus *Parapholidoptera* will be discussed later). According to this proposal, the ancestor of the genus appeared approximately 16 million years ago in Aegeid, a small continent surrounded by Tethys sea.

FURTHER SUPPORT TO THE CASE OF *EUPHOLIDOPTERA*: *POECILIMON* FISCHER, 1853. There are about 120 Phaneropterinae species known for Anatolia at present and a great percentage of them belong to two closely related genera (Çıplak et al., 1999): fifty-nine to *Poecilimon* and thirty-seven to *Isophya* Brunner. As mentioned by La Greca (1999a), distributions of these two genera are striking. Especially, *Poecilimon* is concentrated in Anatolia (59 species), Greece (36 species) and the Balkans roughly up to the Alps (fig. 8). The generic range of these two genera out of these regions includes only few species (Bei-Bienko, 1954; Harz, 1969; Willemse, 1984, 1985; Heller et al., 1998; La Greca, 1999a). On the other hand, there are many representative species in currently isolated Crete and other Aegean islands, like *Eupholidoptera* species. So, the genus *Poecilimon*, like *Eupholidoptera*, could have originated from an Aegeidian stock, whose evolution was mainly influenced by the tectonic events in eastern Mediterranean. Since species of *Poecilimon* are today mostly associated with high altitudes and alpine vegetation, it is possible that rapid divergence in the genus occurred under effects of the glacial and interglacial periods from recent different stocks within their range.

A DISTRIBUTION CORRIDOR BETWEEN SOUTHERN EUROPE AND THE CAUCASUS OVER SOUTHERN ANATOLIA. Anatolia is a bridge between Asia and Europe and provided a natural pathway for faunal communications. At the same time, for some populations or groups, Anatolia presents barriers such as Southern Taurus, South-eastern Taurus and Eastern Taurus (Çıplak et al., 1993; Hesselbarth et al., 1995; Çıplak, 2003) (see Fig 7). However, it seems that the barriers (the mountain ranges in Anatolia) themselves constituted a passage for faunal exchange between the Balkans and the Caucasus for particular groups, while they represented functional barriers for some others (Çıplak, 2003). Distribution patterns of the following groups possibly indicate that there was a distribution corridor between the Caucasus and the Balkans, through the southern Anatolia, not via central and northern Anatolia, during the glacial periods.

Present range of *Parapholidoptera* covers the Caucasus, Transcaucasus, Anatolia, Levant and the south-eastern Balkans (Çıplak, 2000; Katbeh Bader & Massa, 2001; see fig. 10). In Anatolia, species of this genus were recorded from north-eastern quarter, Eastern Taurus which constitute the Anatolian Diagonal belt, and adjoining altitudes, Southern Taurus and Aegean area, mostly at high altitudes. According to the cladogram presented by Çıplak (2000), the genus includes two clades: the *distincta* and the *castaneoviridis* groups. Four species of the first clade, and *P. salmani* Çıplak and *P. spinulosa* Karabağ of the second (the two most basal branches in the *castaneoviridis* clade) are distributed in the Caucasus and in north-eastern quarter of Turkey. This allows us to assume that the genus derived from an ancestor present in the Caucasus/north-eastern Anatolia. The later branches within the *castaneoviridis* clade occur in the southern and western parts of the generic ranges. It seems that the order of the branching events in the *castaneoviridis* clade are correlated with the mountain ranges in Anatolia, in particular the Anatolian Diagonal, the Southern Taurus in Mediterranean Anatolia and Aegean mountains. Additionally, *Parapholidoptera* is represented by one single species (*P. castaneoviridis*) in the Balkans, which is known also from north-western Anatolia.

On the basis of these data, we may assume that the original north-eastern stock extended its distribution to the Balkans via mountain ranges in Anatolia, particularly via Anatolian Diagonal belt, Southern Taurus and Aegean altitudes through several speciation events. There are two additional cases supporting this assumption (Çıplak, 2000). First, there are no representatives which conduct the generic distribution over Black Sea area of Anatolia. Second, excluding *P. salmani* and *P. spinulosa*, the remaining eleven species of the *castaneoviridis* clade differ in few diagnostic characters and this can be assumed as a recent diversification. Moreover, since most of the species are mountainous, this dispersal could have occurred during glacial ages, though it is difficult at present to give exact dates for each of the branching event.

There are other groups of Orthoptera with similar distribution patterns. *Psorodonotus* is another Tettigoniinae genus whose distribution roughly overlaps with that of *Parapholidoptera* (fig. 11). It is dominant in the Caucasus and eastern Anatolian altitudes with six species: *P. specularis* (Fischer de Waldheim), *P. caucasicus* (Fischer de Waldheim), *P. iflatus* (Uvarov), *P. venosus* (Fischer de Waldheim) (this species includes four subspecies: Stolyarov, 1983), *P. davisi* (Karabağ) and *P. rugulosus* (Karabağ) (see Ramme, 1951; Karabağ, 1958; Salman 1978; Stolyarov 1997). It is also present with one species (*P. ebneri* Karabağ) in Southern Taurus, and with another one in western Anatolia (*P. anatolicus* Karabağ). Even though Stolyarov (1997) treated it as a subspecies of *P. caucasicus*, I believe that morphological characters of the two taxa consent to consider them to be two valid species. *P. anatolicus* is also present in the western end of Anatolia, where there is no distribution overlapping with *P. caucasicus*). Additionally there is another species, *P. fieberi* (Frivdalski), which includes two subspecies in the Balkans (Heller et al., 1998). The discovery of a new population (*Psorodonotus* sp.) on Anatolian Diagonal belt completes this puzzle. All species are mountainous and those present in southern and western part of the generic ranges are possibly the relicts of some populations that reached the South and the West through the same mountain ranges in Anatolia, during glacial periods, like the case of *Parapholidoptera*.

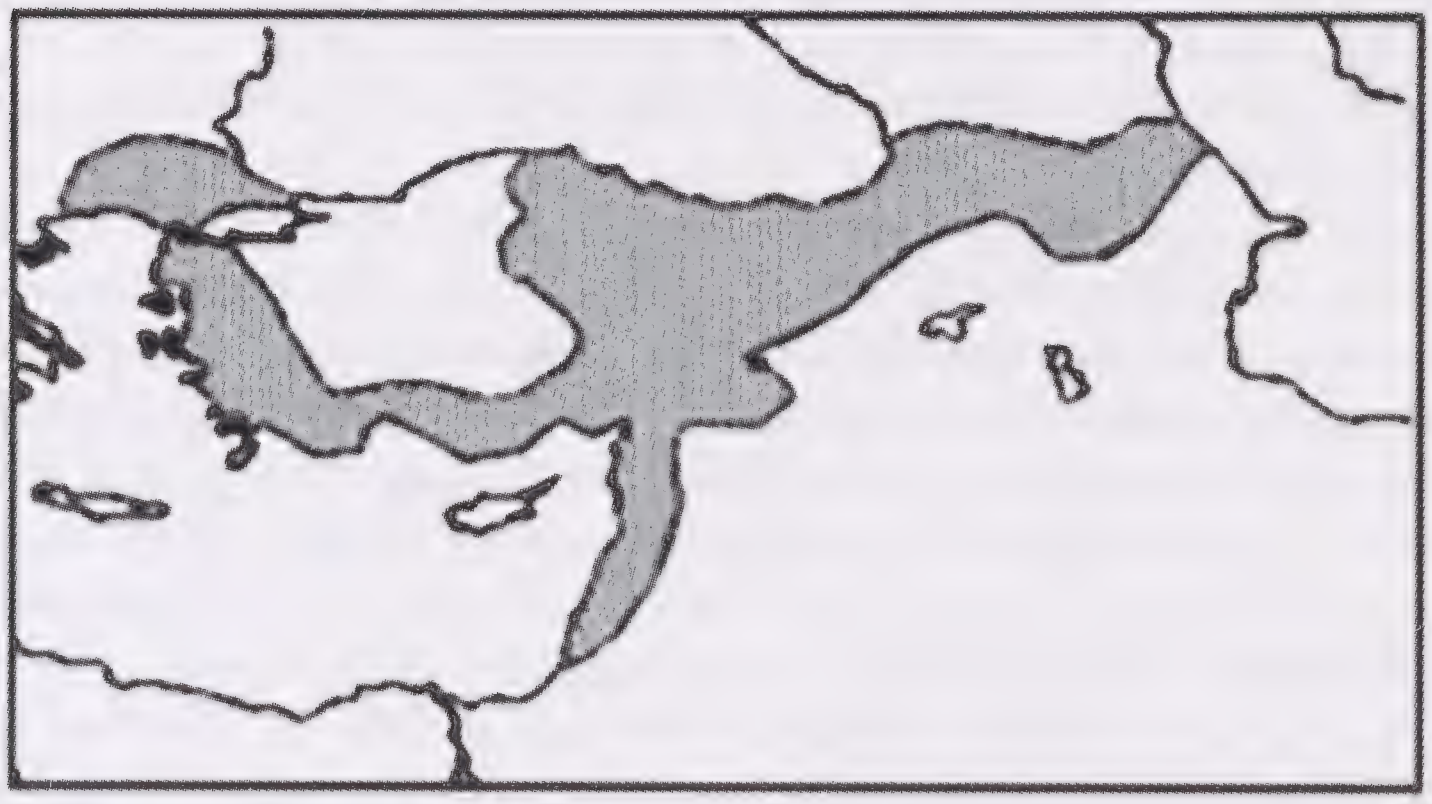

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Fig. 10 - Distribution of the genus *Parapholidoptera*.
Fig. 11 - Distribution of *Psorodonotus* (doted areas represented where species have been recorded).

Another group showing the same distribution pattern is a species group of the genus *Chorthippus* Fischer, here named *demokidovi* group, which can be defined mainly on the base of the precostal area of male tegmen that reaches to its apex. This group includes the following species; *C. abchasicus* Ramme, *C. demokidovi* (Ramme), *C. satunini* Mistshenko and *C. willemsei* Harz. The first three species are known from the Caucasus and east Anatolia (Ramme, 1951; Weidner, 1969; Demirsoy, 1977; Salman, 1978) while the second is known from Greece (Willemse, 1984). Also, there are further three different populations from southern and western Anatolian mountains which were considered to be new species by Mol (2001), that are still undescribed at the moment. It is quite probable that the distribution of this related species group has occurred following the same pathway as the two previous genera, maybe in reverse direction.

CONCLUSIONS

From the distribution patterns exemplified above, it is possible to assume some more general statements.

Fauna present in the regions derived from the Aegeid plate, namely Anatolia, Greece, Aegean islands (including Crete), the Balkans and the Levant, had a similar evolutionary history; it was firstly determined by the tectonic movements of eastern Mediterranean in the Miocene, and subsequently by the glacial-interglacial alternating periods of Pliocene and Pleistocene. The main divergence between Anatolia and Greece occurred since late Miocene, due to the flooding of the Aegean Sea, and the effect of this event is well distinct in the Mediterranean lineages, such as *Eupholidoptera* genus. However, there is still a gliding fauna in north-eastern Anatolia and in the Balkans. According to Gökaşan et al. (1997), Meriç et al. (2000), the Bosphorus is about 7000 years kyr old, faunal communications were thus possible until that date. Besides, the faunal composition of the Caucasus and the Levant shows the same characteristics. The mountain ranges related to Anatolian Diagonal belt, and extended to the Caucasus and Levant, led to a gliding fauna in the Anatolia and these regions.

It seems that the main radiation of the groups presented above presented occurred took place during the glacial periods. This probably occurred for other Orthoptera, such as Pamphaginae and some other genera of Tettigoniinae; then the Pliocene and Pleistocene may be considered the radiation periods of some stocks of the Miocene. If it's so, the large percentage of the Anatolian biodiversity occurred under effects of the successive glacial- and interglacial periods. This assumption is especially supported by the high frequence of the endemism, mainly in southern high altitudes (Çıplak, 2003). In other words, the changes in the range of the some northern populations associated with cold climate caused an increase of species number in "islands" of southern mountains.

Most of the orthopteroid genera or species groups are useful tools in evaluating Anatolian biogeography. Especially, the micro- and brachypterous groups with limited dispersal ability remained as relict populations in the topographically and climatically variable habitats of Anatolia, and now they allow us to trace the biogeographical events in the past in biogeographic respect. All the above mentioned genera or the species groups are micro- or brachypterous and this phenomenon is common among other orthopterans (Ayal et al., 1999; Demirsoy, 1999; Çıplak, 2003). The presence of short wings and the a limited ecological tolerance could result in a reduced dispersal ability. In particular, this may be the case in the Orthoptera living in cold climate and alpine vegetation.

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Salvatrice IPPOLITO & Francesco LOMBARDO

Decimiana clavata, new species from Brazil (Mantidae)[1]

Abstract - The description of a new species of the genus *Decimiana* Uvarov 1940 from Brazil is given. *D. clavata* **n. sp.** is the fifth species of this genus; it is distinctive from the other species known so far for the unusual shape of external male genitalia. This is the second species of *Decimiana* known from Brazil. A key to the species of *Decimiana* concludes the paper.

Riassunto - Decimiana clavata*, nuova specie del Brasile (Mantidae).*
In questo lavoro viene descritta una nuova specie di *Decimiana* del Brasile, *D. clavata* **n. sp.**. Si tratta della quinta specie del genere ed è facilmente distinguibile dalle altre per la forma insolita dell'armatura genitale maschile; si tratta della seconda specie del genere finora rinvenuta in Brasile. Viene inoltre fornita una chiave dicotomica delle specie di *Decimiana* finora note.

Key words: *Mantodea Decimiana clavata,* new species, Brazil.

INTRODUCTION

Among the Acanthopinae belonging to Giglio-Tos's collections we discovered a specimen from Brazil, identified by Giglio-Tos as *Acanthops erosa* Serville, that due to the general shape of the mesothoracic wings must be transferred to the genus *Decimiana.* Furthermore, the examination of the external male genitalia has shown notable differences from those of other species of *Decimiana*; therefore it is necessary to institute a new species.

MATERIAL AND METHODS

This study is based upon one single male specimen of *Decimiana clavata* n. sp., the only specimen known until now, and from the comparison of the complete type and neotype series of *D. tessellata* (Charpentier, 1841), *D. rehni* (Chopard, 1913), *D. bolivari* (Chopard, 1916), *D. hebardi* Lombardo, 2000.

Drawings were made using a Leica M28 stereomicroscope provided with camera lucida. Anatomical terminology follows Snoodgrass (1935) except for the copulatory apparatus which follows La Greca (1954). Measurements were made using a Leitz stereomicroscope.

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[1] This paper is meant as a tribute to the memory of our teacher Prof. Marcello La Greca, who taught us to know and love the Insects.

Decimiana clavata n. sp.

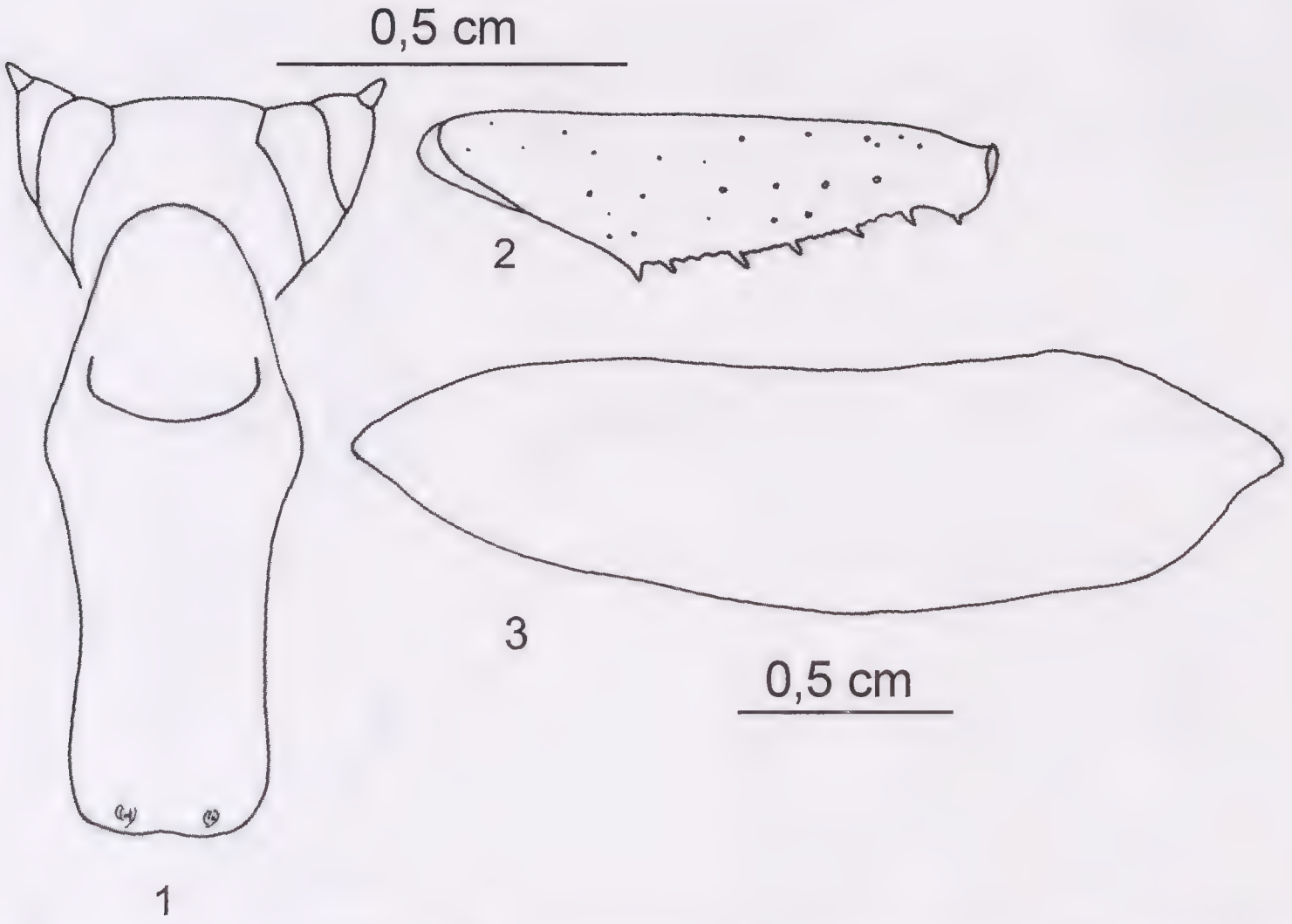
DIAGNOSIS. Medium in size, ochre in colour. Eyes with a small conical tubercle; pronotum stocky; mesothoracic wings moderately sinuous. This species is very similar to *D. tessellata*, it is possible to recognise it only by the study of the male genital apparatus.

TYPE MATERIAL: Holotypus ♂: Brazil (Coll. Giglio-Tos) (MCRT).

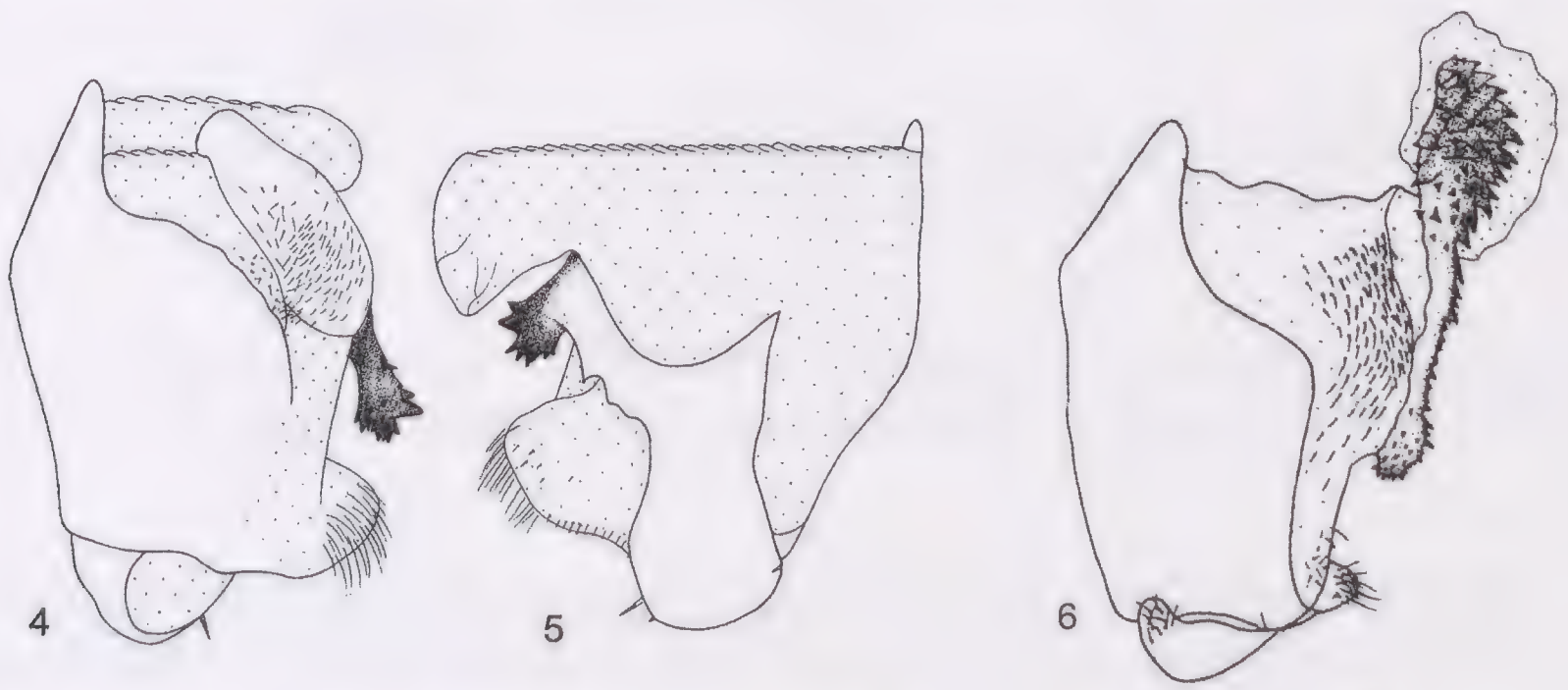
DERIVATIO NOMINIS. This species is named for the particular shape of the anterior process of the left phallomere.

DESCRIPTION. *Head* (fig.1) ochre, 1.65 times as wide as pronotal dilatation with scattered small granules; eyes ovoid with small apical tubercle; frons concave, ocelli large; antennae short ochreous; fastigium of vertex lower than imaginary line joining apex of eyes. Frontal shield transverse, pentagonal; upper margin sinuous, incised at middle; disc granulous. Anteclypeus and postclypeus divided by a middle transversal carina. Labial and maxillari palpi ochreous with last article dark-brown.
THORAX. Pronotum robust (fig. 1), 3.32 times as wide as minimum width of metazona; smooth lateral margins, disc with few scattered granules; supracoxal dilatation largely rounded; disc of metazona with two distal flattened tubercles. Prosternum ochreous anteriorly to coxal sulcus and dark below metazona. Anterior coxae 0.89 times as long as pronotum, prismatic with a quadrangular section; small and numerous tubercles on anterior margin; small spines on posterior margin; anterior surface with ivory callosities. Trocanter ochreous with small granules. Anterior femurs (fig. 2) 3.88 times as long as their maximum width; sparse granules on external surface, upper margin straight; 6 external spines, 4 discoidal spines, 17 internal spines, all ochreous with black apex. Anterior tibiae with 17-18 external spines all brown, with black apex. Middle and hind legs somewhat slender; posterior metatarsi shorter than all other articles together. Wings well developed (fig. 3), extending beyond abdomen; mesothoracic wings opaque brown, 4 times as long as their maximum width; costal margin moderately sinuous with wide excavation and small apical lobe; metathoracic wings hyaline with opaque chestnut apexes; discoidal area homogeneous brown at base and numerous hyaline windows at apex; series of small chestnut concentric strips on anal area.
ABDOMEN. Cylindrical, lateral margin of 3rd and 4th tergite with a rounded lobe; tergites from 2nd to 9th with narrow distal black shiny band; distal margins of sternites with two small teeth, on each side and middle incisure. Supranal plate short, triangular; subgenital plate longer than wide with two small styli.

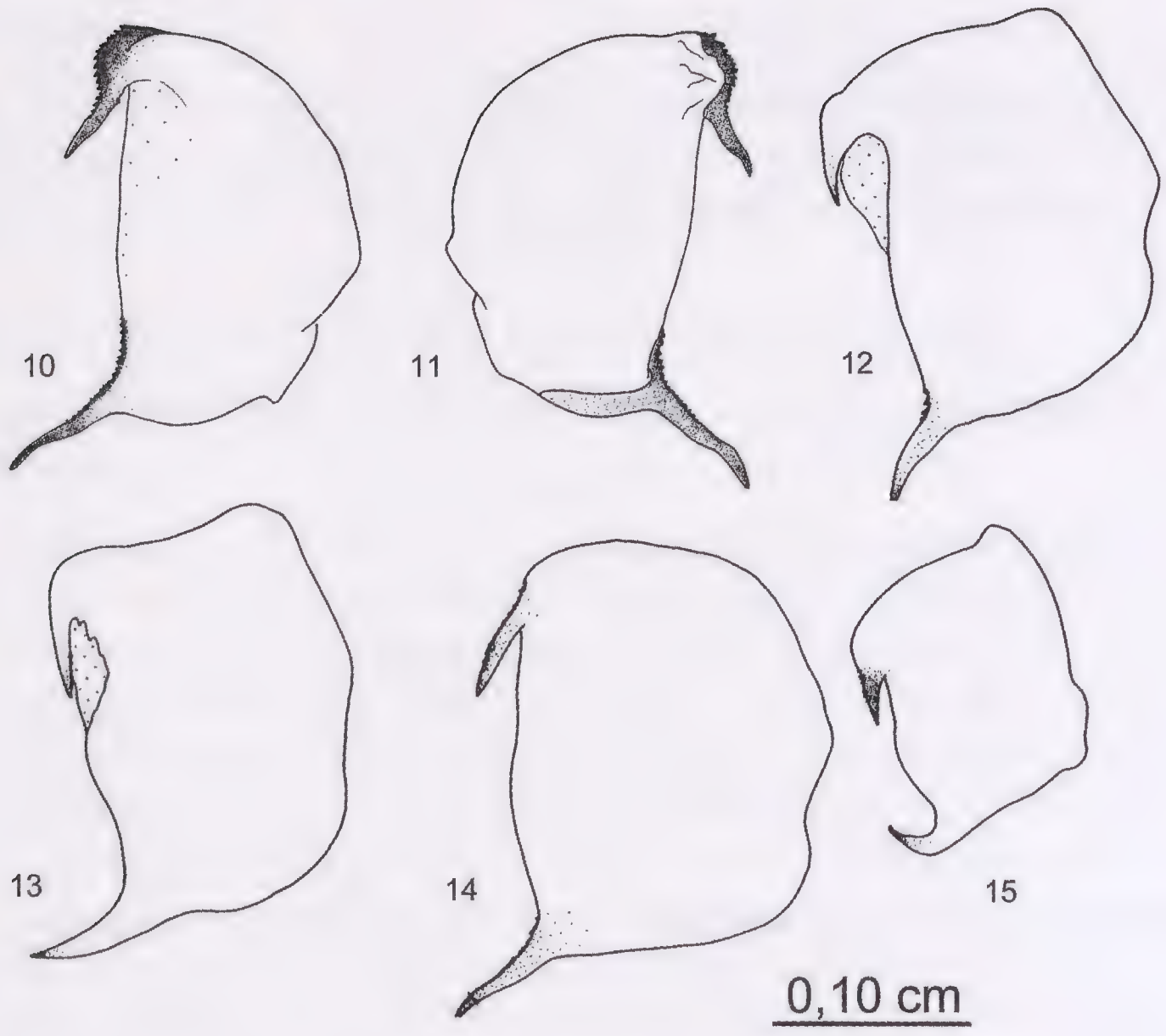
EXTERNAL MALE GENITALIA. Left phallomere (figs 4, 5) with dorsal lamina quadrangular, not well defined at basal median angle; phalloid apophysis membranous with stiff hairs; membranous lobe, rounded apex, long hairs; anterior process of ventral lamina well sclerified, bludgeon-like with robust teeth. Ventral phallomere (figs 10, 11) longer than wide, distal process well developed, moderately sinuous, acute apex; medial margin including basal area of phallomere corpus with small teeth; median process well developed with numerous and robust teeth.



Figs 1-3. *D. clavata* n. sp.: 1 - head and pronotum; 2 - anterior femur; 3 - mesothoracic wing.



Figs 4-9. Left phallomere of *D. clavata* n. sp.: 4 - dorsal view; 5 - ventral view; 6 - *D. tessellata; 7 - D. rehni; 8 - D. bolivari; 9 - D. hebardi.*



Figs 10- 15. Ventral phallomere of *D. clavata* n. sp.: 10 - ventral view; 11 - dorsal view; 12 - *D. bolivari*; 13 - *D. tessellata*; 14 - *D. hebardi*; 15 - *D. rehni*.

MEASUREMENTS (mm). Body length: 35; head width: 5.5; prozona length: 3.1; metazona length: 9.9; coxae length: 8.2; femur length: 9.9; tegminae length: 40.

AFFINITIES

The external morphological features of this new species are very like the other species of *Decimiana*, while there are notable differences in the shape of external male genitalia, as it is evident in figs 4-15.

KEY TO MALES OF GENUS *DECIMIANA*

1. Pronotum slender, ratio length pronotum, minimum width metazona >5 2
- Pronotum robust, ratio length pronotum, minimum width metazone <5.....3
2. Costal margin of mesothoracic wings with more developed excavation; ventral lamina of left phallomere with anterior process sac-like with sparse minute spines .... *D. rehni* (Chopard)
- Costal margin of mesothoracic wings with less developed excavation; ventral lamina of left phallomere with anterior process sac-like with sparse robust teeth .....*D. bolivari* (Chopard)
3. Mesothoracic wings moderatly sinuous with a small apical lobe 4
- Mesothoracic wings more sinuous with a distinct apical lobe .....*D. hebardi* Lombardo
4. Larger; anterior lobe of ventral lamina of left phallomere sac-like with robust teeth .....*D. tessellata* (Charpentier)
- Smaller, anterior lobe of ventral lamina of left phallomere bludgeon-like with robust teeth .....*D. clavata* n. sp.

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Andrej V. GOROCHOV

Review of the subfamily Pteroplistinae (Orthoptera Gryllidae)

Abstract - The Indo-Malayan subfamily Pteroplistinae is shortly characterized and partly revised. All known genera of Pteroplistinae are considered. Four new genera (*Kerinciola* **gen. n.**, *Tembelingiola* **gen. n.**, *Changiola* **gen. n.**, *Pangrangiola* **gen. n.**) and eight new species (*Pteroplistes lagrecai* **sp. n.**, *P. borneoensis* **sp. n.**, *P. sumatranus* **sp. n.**, *K. sonora* **sp. n.**, *T. plana* **sp. n.**, *Ch. subita* **sp. n.**, *Pangrangiola bona* **sp. n.**, *P. propria* **sp. n.**) are described. Some other new data and redescriptions are given.

Riassunto - *Revisione della sottofamiglia Pteroplistinae* (*Orthoptera Gryllidae*).
L'autore, dopo avere brevemente presentato e parzialmente revisionato i caratteri della sottofamiglia Indo-Malese Pteroplistinae, prende in considerazione tutti i generi conosciuti. Quindi, descrive quattro generi nuovi (*Kerinciola* **gen. n.**, *Tembelingiola* **gen. n.**, *Changiola* **gen. n.**, *Pangrangiola* **gen. n.**) ed otto specie nuove (*Pteroplistes lagrecai* **sp. n.**, *P. borneoensis* **sp. n.**, *P. sumatranus* **sp. n.**, *K. sonora* **sp. n.**, *T. plana* **sp. n.**, *Ch. subita* **sp. n.**, *Pangrangiola bona* **sp. n.**, *P. propria* **sp. n.**). Inoltre, per altre specie fornisce un descrizione più dettagliata e nuovi dati distributivi.

Key words: Pteroplistinae, taxonomy, new taxa, Indo-Malayan region.

INTRODUCTION

The subfamily Pteroplistinae was established by Chopard (1936, 1951) for two genera: the recent *Pteroplistes* Brunner de Wattenwyl, with 3 Indo-Malayan species [*Gryllus platyxyphus* Haan, 1842 (Java), *Pteroplistus acinaceus* Saussure, 1877 (Malacca), *P. platycleis* Bolivar, 1900 (India)], and the enigmatic fossil genus *Trichogryllus* Chopard (Eocene Baltic amber), which probably belongs to another subfamily (Gorochov, 1995). The structure of male stridulatory apparatus and male abdominal apex are the fundamental characters for the identification of all the genera and species of Pteroplistinae. Therefore, the generic position of *G. platyxiphus* and *P. platycleis* is uncertain, since their males are unknown. Later, other two species of Pteroplistinae were additionally described by Chopard (1969) from Malacca; they were included in the same genus (*P. perakensis* and *P. similis*), but their male genitalia show that they could belong to some other genera of this subfamily.

In the first phylogenetic scheme of Gryllidae (Gorochov, 1986), the position of Pteroplistinae was still uncertain, but this subfamily was clearly separated from all the other Gryllidae for the characteristic structure of the ovipositor. Later on, Pteroplistinae were mistakenly unified with Landrevinae (Otte, 1988), for an erroneous inclusion of a new Vietnamese species of Landrevinae in the genus *Pteroplistes* (*P. dilinhensis*). This species shows a body shape and spination of hind tibiae similar to those of Pteroplistinae, as they belong to the same group of life forms (Gorochov, 1990, who also

established a new genus for this species of Landrevinae (*Otteana*) and described another genus of Pteroplistinae, with *Tramlapiola sylvestris,* as a new Vietnamese species). The single description of Pteroplistinae published by Otte (1988) corresponds only to Landrevinae, but not to true Pteroplistinae (including the type genus *Pteroplistes*).

The unification of unrelated Landrevinae and Pteroplistinae led Mello (1992) to include the enigmatic Neotropical tribe Odontogryllini in Pteroplistinae sensu Otte. In the catalogus of Grylloidea by Otte (1994) and by Otte et alii (2002) these mistakes were repeated, and two genera of typical Landrevinae (*Otteana* and *Vasilia* Gorochov) were separated from all other genera of this taxon, and put, together with *Pteroplistes*, in the tribe Pteroplistini.

Recently, a third genus of Pteroplistinae with a new species from Borneo (*Crockeriola stolarczyki*) was described (Gorochov & Kostia, 1999), and the position of this subfamily among Gryllidae was shortly revised (Gorochov, 2001): Pteroplistinae were included in the new group of "Phalangopsidae", together with Phalangopsinae, Cacoplistinae, and Phaloriinae (while Oecanthinae were included in the group of "Podoscirtidae"), but Landrevinae remained in the group of "Eneopteridae". The relationship among representatives of "Phalangopsidae" is supported by the characteristic structure of male stridulatory apparatus, especially by the presence of two or more dividing veins in the mirror. Sometimes, the latter character is absent, but the conservation of this primitive peculiarity in majority of "Phalangopsidae" may be considered a sort of synapomorphy for this group.

It is to note that the fossil genus *Eneopterotrypus* Zeuner (Oligocene of Europe), presumably included in Pteroplistinae for a certain similarity in male tegmina (Gorochov, 1995), may also belong to any of the other subfamilies of "Phalangopsidae" or to Gryllomiminae.

SYSTEMATIC PART

This paper is based on material from the following institutions: Zoological Institute, RAS, S. Petersburg (ZIAS); Natural History Museum, London (BMNH); Natural History Museum, Vienna (NHMW), Museum and Institute of Zoology, PAS, Warsaw (MIZP), Institute of Systematics and Evolution of Animals, PAS, Krakow (ISEA).

Subfamily Pteroplistinae Chopard, 1951

Chopard, 1951 (Pteroplistidae); Chopard, 1968 (Pteroplistinae).

DIAGNOSIS**.** Head and body dorsoventrally depressed. Head almost prognathous, short; eyes large, but not globular; rostrum arched in profile; its width approximately equal to width of scape; genae narrow; mouthparts short (figs 1-3). Pronotum transverse, slightly narrowing in front; its lateral lobes narrow, with distinctly oblique lower edge (figs 1, 3). Legs short and not thin; fore tibiae with 1 or 2 oval tympana; hind tibiae much shorter than hind femora, with numerous denticles and few short subapical spines on upper side; apical spines (spurs) of these tibiae not long (the longest of them shorter than half of hind metatarsus); hind metatarsus with several small denticles on upper side

(figs 1, 5-9). Male tegmina with straight or slightly arched stridulatory vein (not S-shaped as in Landrevinae); mirror large, with 2 dividing veins parallel and situated very close to each other; area between R and M somewhat widened (figs 4, 11, 20, 23, 82-88). Cerci very long (fig. 85). Ovipositor high, laterally compressed, slightly curved upwards, with distal part gradually narrowing and acute apex (figs 13, 18); structure of ovipositor strongly distinguishable from that of all other Grylloidea: left and right valvae immovably connected with each other by special sutures (except in their distal part) (figs 21, 22), inner valvae absent (or very strongly reduced), bases of both upper valvae fused with each other, with second valvifers, and with hind intermediate plate (figs 14, 15); copulatory papilla membranous (fig. 16).

COMPOSITION. Seven genera: *Pteroplistes* Brunner de Wattenwyl, 1873, *Tramlapiola* Gorochov, 1990, *Crockeriola* Gorochov et Kostia, 1999, *Kerinciola* gen. n., *Tembelingiola* gen. n., *Changiola* gen. n., and *Pangrangiola* gen. n.

MODE OF LIFE. The representatives of this subfamily (with known mode of life) live on trunks and branches of living trees in tropical forest. During the day, these insects hide themselves inside the fissures under the dead parts of the bark. At night, they run on the bark, sing usually near the tangle of branches or lianas (sometimes inside the wide fissures under the dead bark or under some other similar refuge on the bark), and lie their eggs into the narrow cracks of the bark. Interestingly, the representatives of *Otteana* from the subfamily Landrevinae have very similar mode of life, but their ovipositor is typical of Gryllidae (Gorochov, 1996), probably adapted to oviposition into soil.

Genus *Pteroplistes* Brunner de Wattenwyl, 1873

= *Pteroplistus* Saussure, 1877 (unjustified emendation).

Type species *Pteroplistus acinaceus* Saussure, 1877 (subsequent designation).

DIAGNOSIS. Body large (length of hind femora 13-14 mm). Inner tympanum medium-sized; outer tympanum small (figs 5, 6). Male tegmina with comparatively small mirror and long apical area (length of this area not shorter or slightly shorter than length of mirror) (figs 1, 11, 82-84). Male anal plate with a pair of short hooks (figs 27, 31, 35, 39); distal part of male genital plate wide, truncated, and with hind median denticle (figs 10, 27, 31, 39). Male genitalia with epiphallus H-shaped; guiding rod long, not wide, partly sclerotized, and with upper process bifurcated or unpaired; endoparameres more or less fused with the guiding rod, long, ribbon-like, roundly or angularly curved, without distinct apodemes; mold of spermatophore attachment plate articulated with endoparameres; ectoparameres and additional plate-like sclerites absent (figs 24-26, 28-30, 32-34, 36-38). Ovipositor nearly 13 mm long (fig. 13).

INCLUDED SPECIES: type species, *P. lagrecai* sp. n., *P. borneoensis* sp. n., and *P. sumatranus* sp. n.

Pteroplistes lagrecai sp. n. (figs 24-27, 82)

HOLOTYPE. Male, Borneo, "Nord-Borneo, Waterstradt" (ZIAS).

DESCRIPTION. Male (holotype). Body similar to that of *P. acinaceus* in size, coloration (brown, slightly spotted), and structure, but tegmina with hardly longer mirror and slightly shorter apical area (almost as long as the mirror; in *P. acinaceus*, the mirror is slightly shorter than the apical area; for comparison see figs 11, 82), hooks of anal plate with narrow basal part, concavity between them smaller and with distinct tubercle on fore edge, genital guiding rod with upper process slightly bifurcated and almost not hooked (in *P. acinaceus*, this process strongly bifurcated and with apical hooks), shape of endoparameres and mold of spermatophore attachment plate distinctly different (for comparison see figs 24-27, 32-35).

Female unknown.

Length (mm). Body 16.5; body with wings 22; pronotum 3.4; tegmina 15; hind femora 13; hind tibiae 9.

DERIVATIO NOMINIS. This species is named in memory of the Italian orthopterist Prof. Marcello La Greca.

Pteroplistes borneoensis sp. n. (figs 28-31, 83)

HOLOTYPE. Male, Borneo, "Sarawak. 1909. C.J. Brooks. B.M. 1931-570", "*Pteroplistus acinaceus* Saus. Chopard det." (BMNH).

DESCRIPTION. Male (holotype). Body similar to that of *P. acinaceus* and *P. lagrecai*, but tegmina as in *P. lagrecai* (fig. 83), hind wings shorter (slightly longer than tegmina), anal plate with distinctly shorter hooks (fig. 31), genital guiding rod wider, slightly curved, and with upper process almost not bifurcated, endoparameres and mold of spermatophore attachment plate narrower (figs 28-30).

Female unknown.

Length (mm). Body 17; body with wings 21.5; pronotum 3.3; tegmina 15.5 (hind legs missing).

DERIVATIO NOMINIS. From the type locality.

Pteroplistes sumatranus sp. n. (figs 36-39, 84)

HOLOTYPE. Male, Sumatra, "Sandaran Agong, Korinchi Valley. 2,500 ft. June 1914" (BMNH).

DESCRIPTION. Male (holotype). Body as in the other known congeners, but tegmina as in *P. lagrecai* and *P. borneoensis* (fig. 84), hind wings as in *P. acinaceus* and *P. lagrecai,* anal plate with hooks distinctly smaller and with the area between them narrower than in other congeners (fig. 39), genital guiding rod narrow, strongly curved, and with upper process not bifurcated and almost not hooked, shape of endoparameres and mold of spermatophore attachment plate as in figs 36-38.

Female unknown.

Length (mm). Body 17.5; body with wings 22.5; pronotum 3.5; tegmina 16; hind femora 13; hind tibiae 9.

DERIVATIO NOMINIS. From the type locality.

Pteroplistes acinaceus Saussure, 1877 (figs 1-13, 17, 32-35)

LECTOTYPE. Male, "Malacca", "4365", "typus", "*Pteroplistus acinaceus* Sauss." (NHMW).
PARALECTOTYPE. Female, "Malacca", "4362" (NHMW).

NOTE. The original description of *P. acinaceus* (Saussure, 1877) is sufficient, except for what concerns the male genitalia which were drawn for the first time by Gorochov (1990), who also designated the lectotype of this species. The differences of *P. acinaceus* from 3 above-mentioned species are listed in their descriptions.

Genus ***Kerinciola*** gen. n.

Type species *Kerinciola sonora* sp. n.

DIAGNOSIS. Body smaller than in *Pteroplistes* (length of hind femora 9-12 mm). Tympana similar to those of *Pteroplistes*, but hardly larger. Male tegmina with mirror larger than in *Pteroplistes* and much longer than apical area (fig. 85). Male anal plate simple, without hooks, and with apical part narrower than in *Pteroplistes* (fig. 45); distal part of male genital plate narrow, with hind median denticle (figs 43, 44). Male genitalia similar to those of *Pteroplistes*, but guiding rod without upper process, and endoparameres not connected with mold of spermatophore attachment plate (figs 40-42). Ovipositor probably short (cf. *Kerinciola similis* and fig. 18).

INCLUDED SPECIES: type species and possibly *Pteroplistus similis* Chopard, 1969.

DERIVATIO NOMINIS. From Kerinci Mt (Sumatra).

Kerinciola sonora sp. n. (figs 40-45, 85)

HOLOTYPE. Male, Sumatra, prov. Jambi, 35 km N of Sungaipenuh, National park Kerinci-Seblat, Mt Kerinci, 1500-2000 m, primary forest, 18-22.XI.1999, A. Gorochov (ZIAS).

DESCRIPTION. Male (holotype). Coloration light brown with several dark brown spots. Tegmina with mirror slightly transverse (fig. 85); hind wings slightly shorter than tegmina. Anal and genital plates as in figs 43-45. Genitalia with characteristic shape of epiphallic distal part (fig. 40); guiding rod with membranous median part and a pair of narrow lateral sclerites; endoparameres bifurcated (figs 41, 42).

Female unknown.

Length (mm). Body 12; body with wings 14.5; pronotum 2.8; tegmina 10.5; hind femora 9.7; hind tibiae 6.6.

DERIVATIO NOMINIS. From Latin (sonorus), sonorous.

?Kerinciola similis (Chopard, 1969) (figs 18, 19)

FEMALE, Malacca, Perak, Sungai Enam, subcamp 850 m, 11-12.IV.1994, I. Sivec (ZIAS).

NOTE. This species was described from Malacca: the holotype (male) from Perak and the paratype (female) from Pahang. The male differs from *K. sonora* in epiphallus for wider distal lobes, for lacking tubercles between them, and for hooked lateral projections of these lobes (Chopard, 1969: fig. 151). The above-mentioned female is very similar to Chopard's description of the paratype including the shape of genital plate, but its ovipositor is somewhat longer: 7.5 mm in the female from Perak (length of its hind femora 10.5 mm), 6.5 mm in the female from Pahang (length of its hind femora 12 mm). It cannot be excluded that the paratype belongs to another species.

Genus *Tramlapiola* Gorochov, 1990

Type species *Tramlapiola sylvestris* Gorochov, 1990.

DIAGNOSIS. Genus similar to *Kerinciola* in its general appearance including structure of male tegmina (figs 20), but apical part of male anal plate much wider (fig. 49), distal part of male genital plate slightly wider (but distinctly narrower than in *Pteroplistes*) and almost without hind median denticle (figs 50, 51), male genitalia with epiphallus divided into left and right sclerites isolated from each other, guiding rod with upper process similar to that of *Pteroplistes*, endoparameres almost not curved, short (but ribbon-like and clearly not connected with mold of spermatophore attachment plate, almost as in *Kerinciola*) (figs 46-48). Ovipositor short, nearly 7 mm long.

INCLUDED SPECIES: type species only.

Tramlapiola sylvestris Gorochov, 1990 (figs 20, 46-52)

MALE (Holotype), Vietnam, prov. Gia Lai, 40 km N of Kannack, Tram Lap, 800 m, primary forest, 21.XI-14.XII.1988, A. Gorochov (ZIAS). 4 males and 3 females (paratypes), same data as holotype (imago of 2 males obtained on I.1989) (ZIAS); 1 female, same locality, 21.IV.1995, A. Gorochov (ZIAS); 3 males and 1 female, same province, 20 km N of Kannack, Buon Luoi, 700 m, primary forest, 3-15.XI.1993, A. Gorochov (ZIAS); 10 males and 11 females, same locality, 1.IV-10.V.1995, A. Gorochov (ZIAS); 1 male and 2 females, same province, 50-60 km N of Kannack, Kon Cha Rang, 1000-1200 m, primary forest, 14-20.IV.1995, A. Gorochov (ZIAS).

NOTE. This species distinctly differs from representatives of *Kerinciola* almost only in the male genitalia. Female of *T. sylvestris* is hardly distinguished from that of *?K. similis* by the genital plate with the apical part slightly narrower (fig. 52).

Genus ***Tembelingiola*** gen. n.

Type species *Tembelingiola plana* sp. n.

DIAGNOSIS. General appearance similar to those of *Kerinciola* and *Tramlapiola* including structure of male tegmina (fig. 86). Male anal plate similar to that of *Kerinciola*,

except for its apex bringing a pair of lateral denticles (fig. 58). Male genital plate similar to that of *Tramlapiola* (figs 56, 57). Male genitalia well distinguished from those of all known genera: epiphallus divided into left and right sclerites almost isolated from each other; guiding rod short and without upper process; endoparameres straight, moderately long, and clearly not connected with mold of spermatophore attachment plate; ectoparameres and additional plate-like sclerites developed (figs 53-55).

INCLUDED SPECIES: type species only.

DERIVATIO NOMINIS. From Tembeling river (Malacca).

Tembelingiola plana sp. n. (figs 53-58, 86)

HOLOTYPE. Male, Malacca, Pahang, environs of National park Taman Negara, Kuala Tahan near river Tembeling, primary forest, 12-16.VII.1996, A. Gorochov (ZIAS).

DESCRIPTION. Male (holotype). Coloration light brown with brown and dark brown spots. Tegmina with mirror almost round (fig. 86); length of tegmina similar to that of hind wings. Anal and genital plates as in figs 56-58. Genitalia with left and right halves of epiphallus connected with each other by transverse sclerite situated along hind edge of ventral surface of epiphallic lobe (fig. 53); guiding rod strongly widened at base, with hardly bifurcated apex (fig. 54); ectoparameres moderately long, narrow, but with widened base (figs 54, 55).

Female unknown.

Length (mm). Body 11.5; body with wings 14.5; pronotum 2.4; tegmina 10.2; hind femora 9.8; hind tibiae 6.8.

DERIVATIO NOMINIS. From Latin (planus), flat.

Genus ***Changiola*** gen. n.

Type species *Changiola subita* sp. n.

DIAGNOSIS. Size, shape of body, and structure of tegmina similar to those of *Kerinciola*, *Tramlapiola*, and *Tembelingiola*, but coloration less spotted (fig. 87). Tympana hardly smaller than in these genera (almost as in *Pteroplistes*); outer tympanum probably sometimes reduced. Male anal plate intermediate between *Kerinciola* and *Tramlapiola* (fig. 62). Male genital plate similar to that of *Tramlapiola* and *Tembelingiola*, but hind edge with median notch (figs 63, 64). Male genitalia distinctly differs from those of all known genera: epiphallus complete, with H-shaped distal part, but with S-shaped proximal parts (fig. 59); guiding rod moderately long, without upper process; endoparameres also moderately long, curved, not connected with mold of spermatophore attachment plate; ectoparameres and additional plate-like sclerites developed (figs 60, 61). Ovipositor short; its length probably near 5.5 mm.

INCLUDED SPECIES: type species and possibly *Pteroplistus perakensis* Chopard, 1969.

DERIVATIO NOMINIS. From Chang I. (Thailand).

Changiola subita sp. n. (figs 59-64, 87)

HOLOTYPE. Male, Thailand, prov. Trat, Chang I. (Siam bay), lower mountains near sea, forest, 5-20.XI.2000, A. Gorochov (ZIAS).

DESCRIPTION. Male (holotype). Head and pronotum uniformly brown; tegmina and legs light brown with brown spots (tegminal spots weakly distinct); palpi, lower part of thorax, and abdomen light brown, almost uniform. Tegmina with mirror hardly transverse (fig. 87); hind wings slightly shorter than tegmina. Anal and genital plate as in figs 62-64. Genitalia with apex of guiding rod narrow and acute; ectoparameres very long, completely narrow; mold of spermatophore attachment plate and additional plate-like sclerites connected with each other (figs 59-61).

Female unknown.

Length (mm). Body 12.5; body with wings 13.5; pronotum 2.7; tegmina 9.5; hind femora 8.5; hind tibiae 5.9.

COMPARISON. This species differs from *?Ch. perakensis* (Malacca: Perak) in the outer tympanum well developed, the epiphallus with hind processes distinctly shorter, and the ectoparameres with proximal parts much shorter.

DERIVATIO NOMINIS. From Latin (subitus), unexpected.

Genus *Crockeriola* Gorochov et Kostia, 1999

Type species *Crockeriola stolarczyki* Gorochov et Kostia, 1999.

DIAGNOSIS. This genus similar to *Kerinciola*, *Tramlapiola*, *Tembelingiola*, and *Changiola* in size, shape, and structure of male tegmina (fig. 23), except for strongly spotted coloration. Inner tympanum as in *Changiola*; outer tympanum reduced. Male anal plate almost as in *Tramlapiola* (fig. 73). Male genital plate wider than in all these genera (slightly narrower than in *Pteroplistes*); its hind edge with angular median notch (fig. 69). Epiphallus with distal lateral processes complicated and proximal parts almost as in *Changiola*; guiding rod short, without upper process; endoparameres similar to those of *Changiola*, but with semimembranous area between them; ectoparameres absent; additional plate-like sclerites large (figs 70-72).

INCLUDED SPECIES: type species only.

Crockeriola stolarczyki Gorochov et Kostia, 1999 (figs 23, 69-73)

HOLOTYPE. Male, Borneo, Sabah, Mt Crocker, 500-1000 m, Gunnung Emas, 6-21.V.1995, I. Stolarczyk (ISEA).

NOTE. Only the male (holotype) of this species is known (Gorochov & Kostia, 1999). It is well distinguished from all other known Pteroplistinae by numerous characters listed in the generic description.

Genus ***Pangrangiola*** gen. n.

Type species *Pangrangiola bona* sp. n.

DIAGNOSIS. Body similar to *Kerinciola*, *Tramlapiola*, and *Tembelingiola* in general appearance and also to *Changiola* and *Crockeriola* in structure of male tegmina (fig. 88). Tympana as in *Crockeriola*. Male anal plate almost as in *Tramlapiola* and *Crockeriola*. Male genital plate rather diverse. Male genitalia distinguished from all other known Pteroplistinae by epiphallus short and almost without hind processes, guiding rod short and acute, endoparameres short, slightly curved or almost straight, ectoparameres developed, their bases fused with endoparameres and guiding rod, spermatophore sac distinct, mold of spermatophore attachment plate large, oval, and well movable (figs 74-79). Ovipositor short (fig. 80).

INCLUDED SPECIES: type species and *P. propria* sp. n.
REMARKS. It is possible that *Platyxyphus* Walker, 1869 is a senior synonym of this genus, and *Gryllus platyxyphus* Haan, 1842 from Java (=*Platyxyphus javanus* Walker, 1869; both specific names are based on the same type specimen) is a senior synonym of one of two species included in *Pangrangiola*. However, the descriptions by Haan (1842) and by Walker (1869) don't give any possibility for generic or specific determination, as they are insufficient and based on female [there is the additional female from "Java" (MIZP) very similar to females of *Pangrangiola* (including structure of ovipositor and genital plate), but it may belong to another genus, as its outer tympanum is well developed].

DERIVATIO NOMINIS. From Pangrango Mts (Java).

Pangrangiola bona sp. n. (figs 74-76, 88)

HOLOTYPE. Male, Java, 20-25 km SE of Bogor, Mts Pangrango, environs of Cemande, 1000 m, forest, 27.XI-7.XII.1999, A. Gorochov (ZIAS). Paratypes. 3 males, same data as holotype (ZIAS).

DESCRIPTION. Male (holotype). Head dark brown with distinct whitish spots on lower part; antennae, palpi, tegmina and legs light brown with dark brown spots; pronotum almost uniformly brown; abdomen light brown; cerci darker, brown. Tegmina with mirror slightly transverse (fig. 88); hind wings slightly shorter than tegmina. Genital plate with median lobule at apex (figs 65, 66). Genitalia as in figs 74-76.
Variations. Pronotal disc of paratypes with reddish spots which distinct or almost indistinct.

Female unknown.

Length (mm). Body 11-12; body with wings 13-14; pronotum 2.6-2.8; tegmina 9-10; hind femora 9-9.5; hind tibiae 6-6.5.

DERIVATIO NOMINIS. From Latin (bonus), good.

Pangrangiola propria sp. n. (figs 77-81)

HOLOTYPE. Male, Java, "Java occ. Fr." (MIZP). Paratypes. 2 females, same data as holotype (MIZP, ZIAS).

DESCRIPTION. Male (holotype). It is very similar to *P. bona* with distinct reddish spots on pronotal disc, but genital plate with distinct notch at apex (figs 67, 68), epiphallus with hind lobes wider and notch between them distinctly narrower, base of ectoparameres with lateral projection longer, endoparameres shorter (figs 77-79).

Female. General appearance and ovipositor similar to those of females of all genera of Pteroplistinae above-mentioned, except *Pteroplistes* (fig. 80), but coloration as in male of this species and genital plate with apical notch almost as in *Pteroplistes* (fig. 81).

Length (mm). Body: male 13.5, female 14-15; body with wings: male 14.5, female 14.5-15.5; pronotum: male 2.5, female 2.8-3; tegmina: male 10, female 9-9.5; hind femora: male 9, female 9-9.5; hind tibiae: male 6, female 6.3-6.5; ovipositor 6.5-6.7.

DERIVATIO NOMINIS. From Latin (proprius), peculiar.

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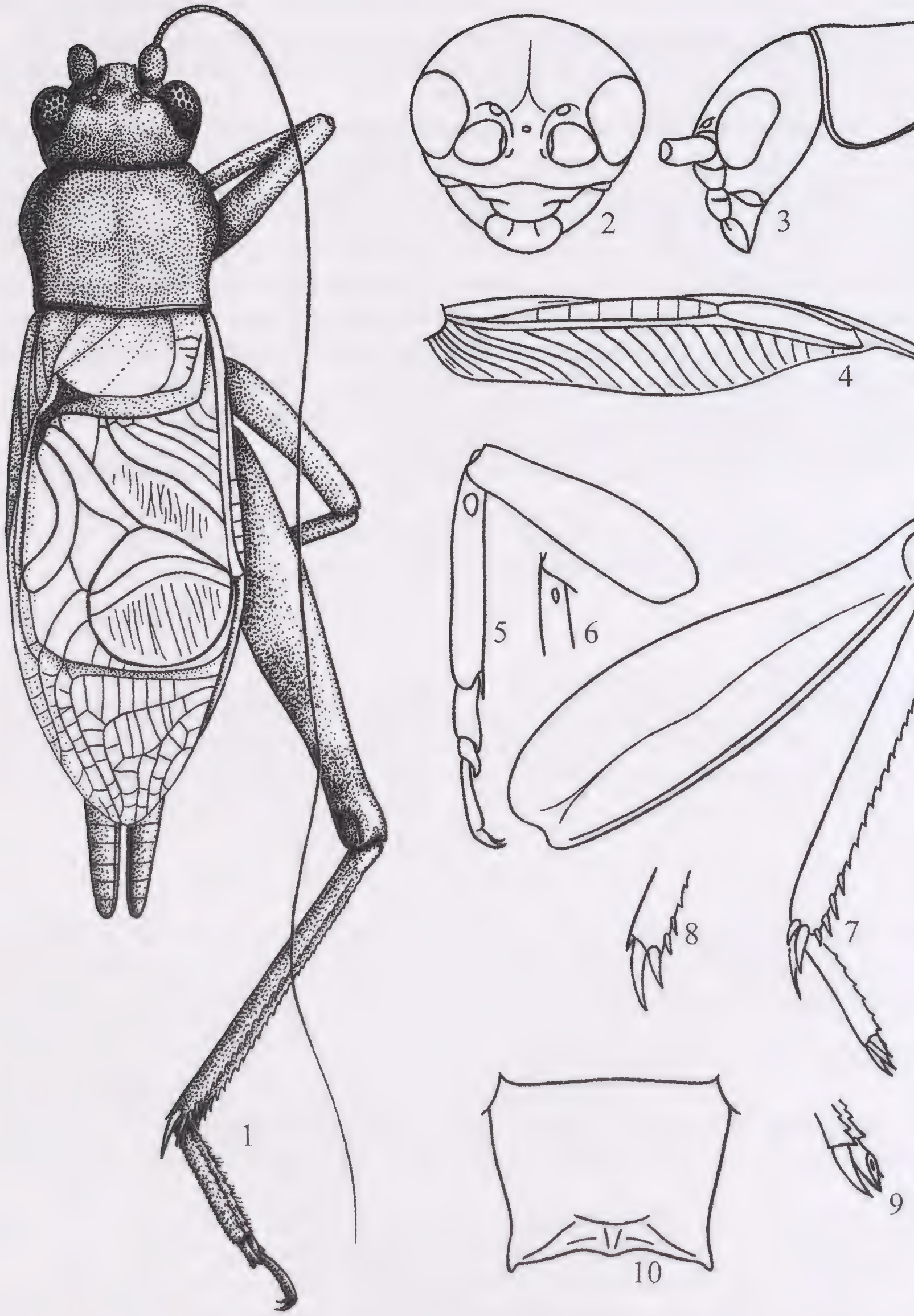
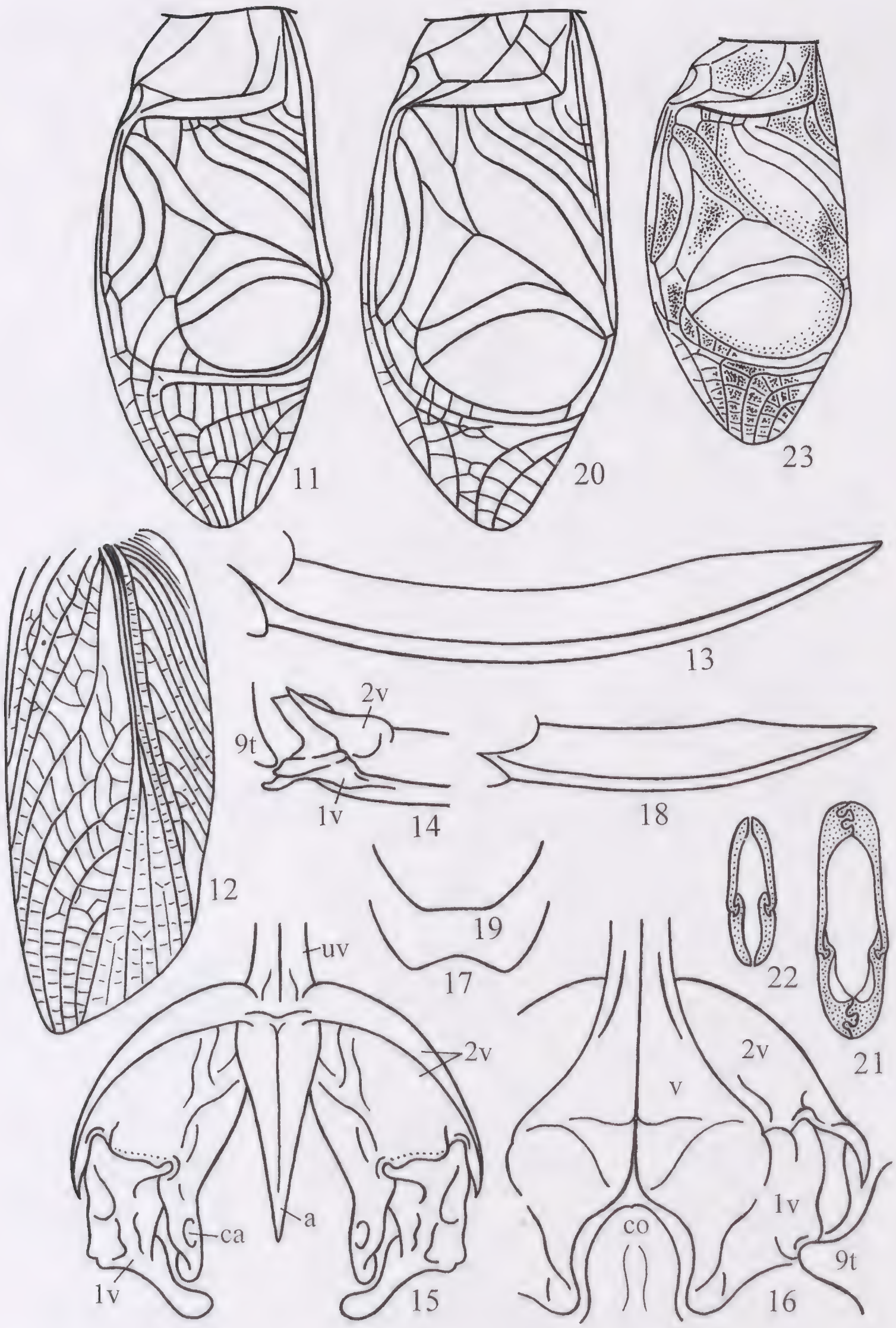
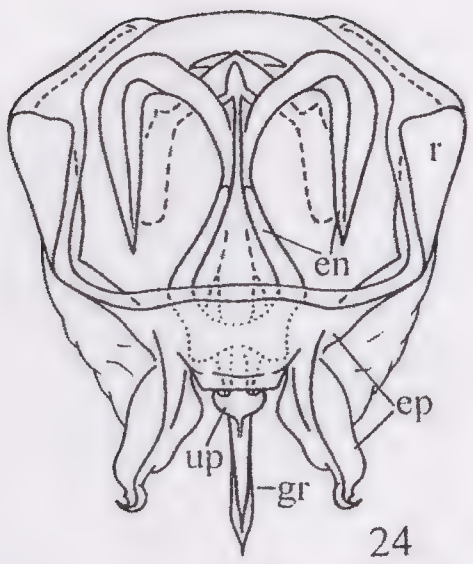


Figs 1-10. *Pteroplistes acinaceus* Sauss., male (lectotype). 1 - general view from above; 2 - head (frontal view); 3 - head and pronotum (lateral view); 4 - lateral part of tegmen; 5 - inner side of fore leg; 6 - outer side of proximal part of fore tibia; 7 - outer side of hind leg; 8 - inner side of distal part of hind tibia; 9 - second segment of hind tarsus and distal part of its first segment from side and slightly above; 10 - genital plate from below.



Figs 11-23. Pteroplistinae. 11-17, *Pteroplistes acinaceus* Sauss. (11, lectotype); 18-19 - *?Kerinciola similis* (Chop.); 20-22 - *Tramlapiola sylvestris* Gor. (20, holotype); 23 - *Crockeriola stolarczyki* Gor. et Kostia (holotype). Dorsal part of male tegmen (11; 20; 23); female tegmen (12); ovipositor from side (13; 18); proximal part of ovipositor from side (sclerites only) (14), from above (sclerites only) (15), and from below (16); hind half of female genital plate from below (17; 19); transverse section of middle (21) and distal (22) parts of ovipositor (scheme). Abbreviations: **a**, apodeme of hind intermediate plate; **ca**, cavity for articulation with fore intermediate plate (this plate not pictured); **co**, copulatory papilla; **9t**, 9th abdominal tergite; **uv**, upper valva; **v**, lower valva; **1v**, **2v**, 1st and 2nd valvifers.



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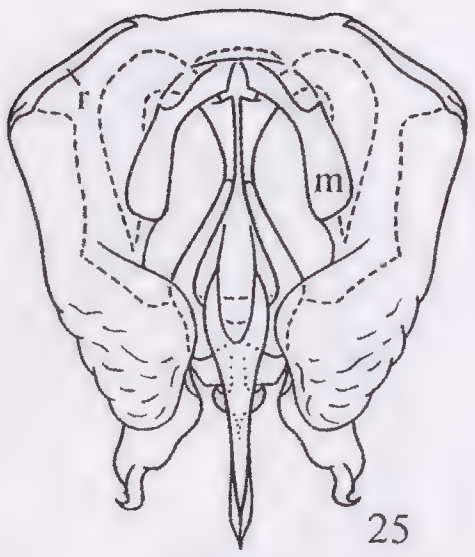

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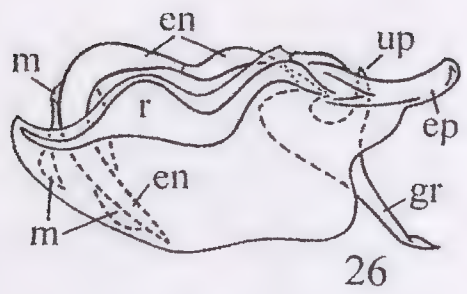

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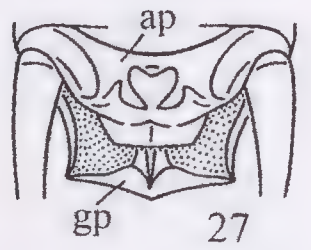

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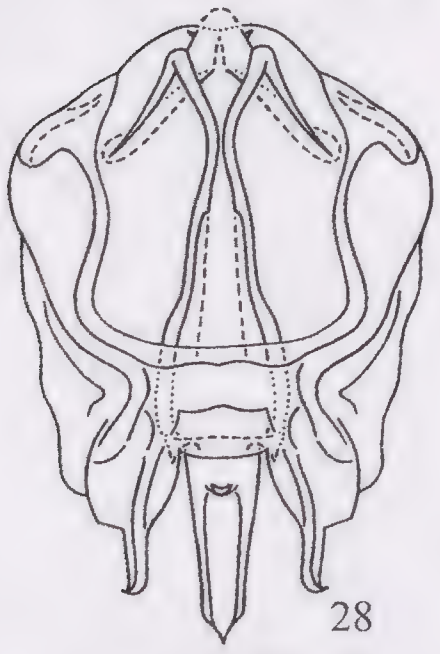
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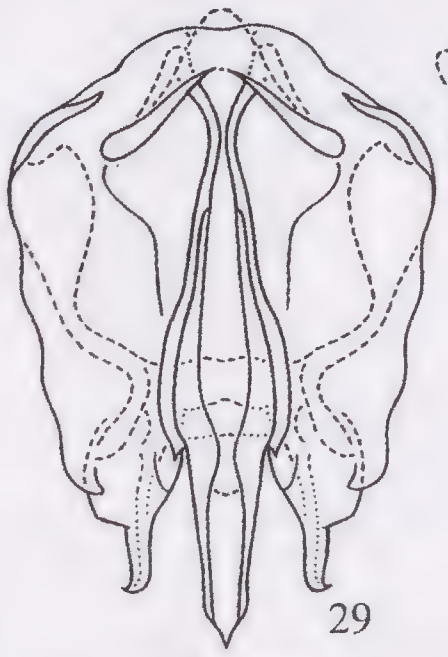
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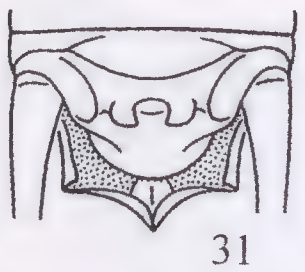
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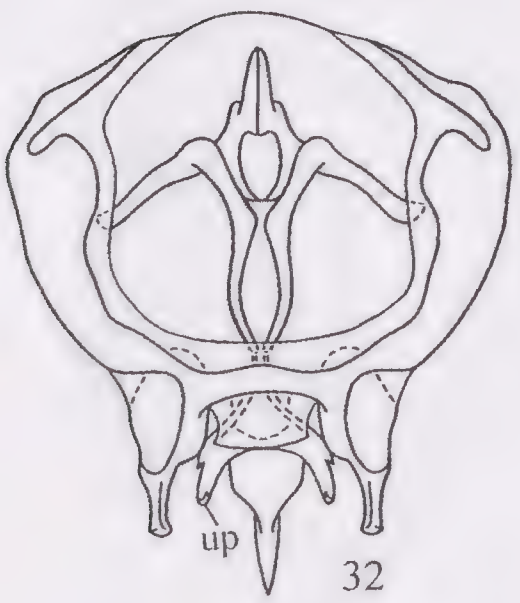

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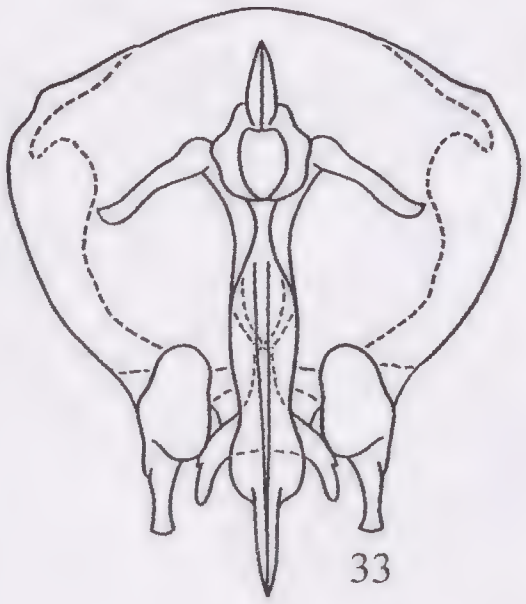
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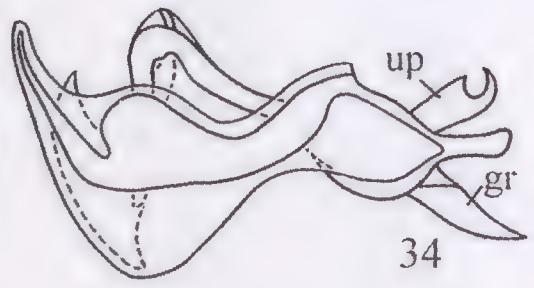

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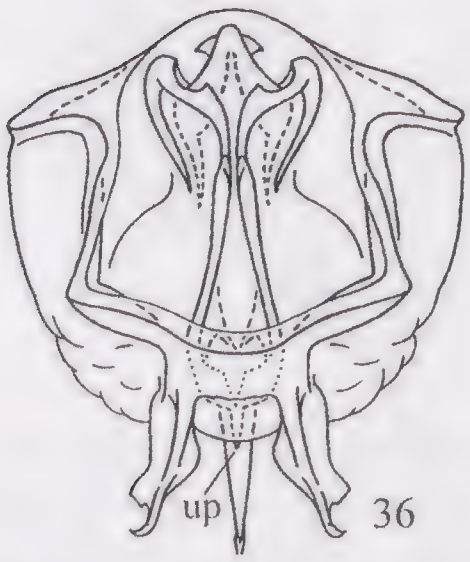

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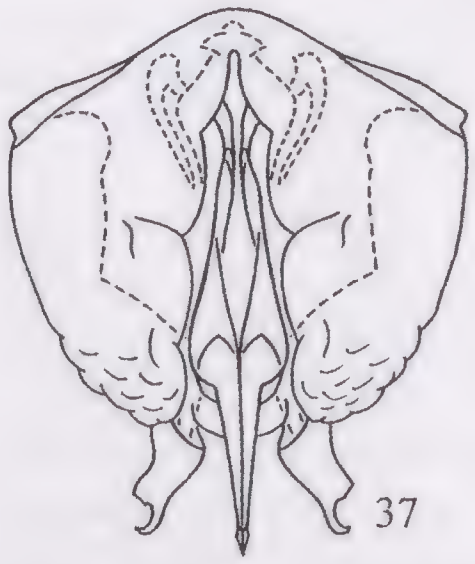
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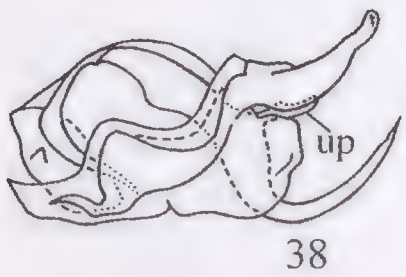

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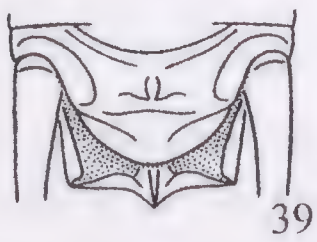
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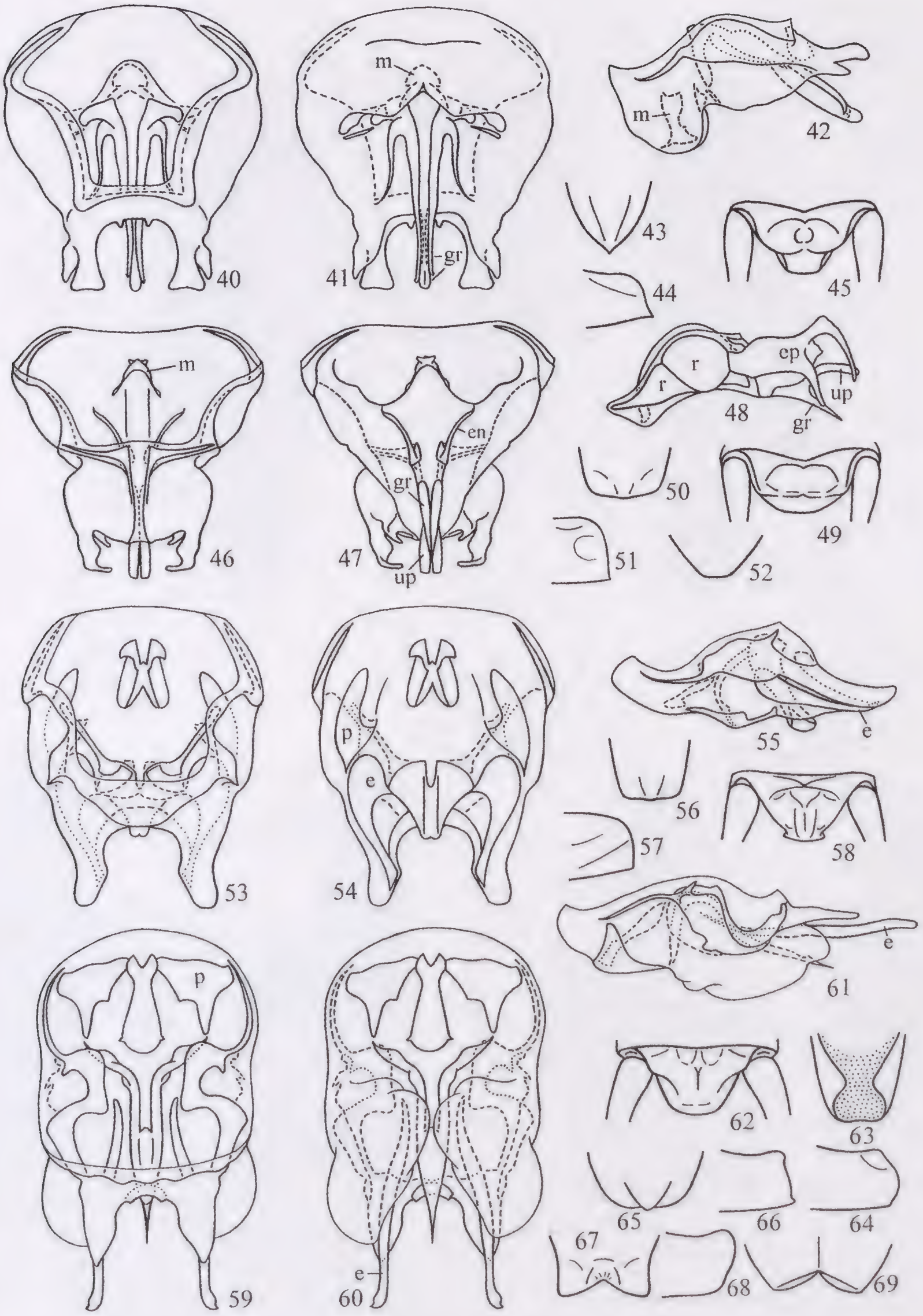
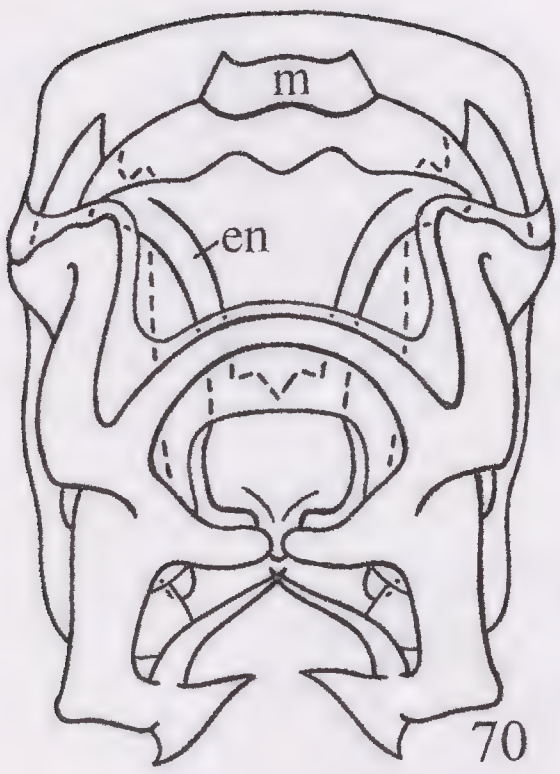
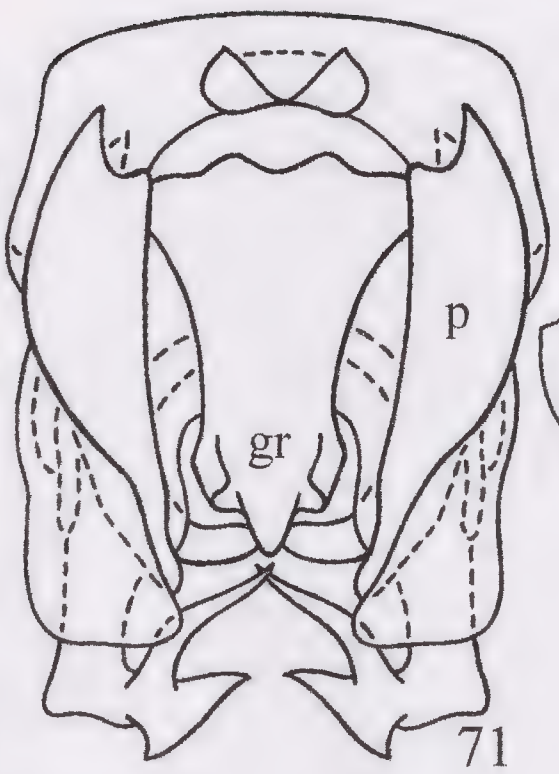
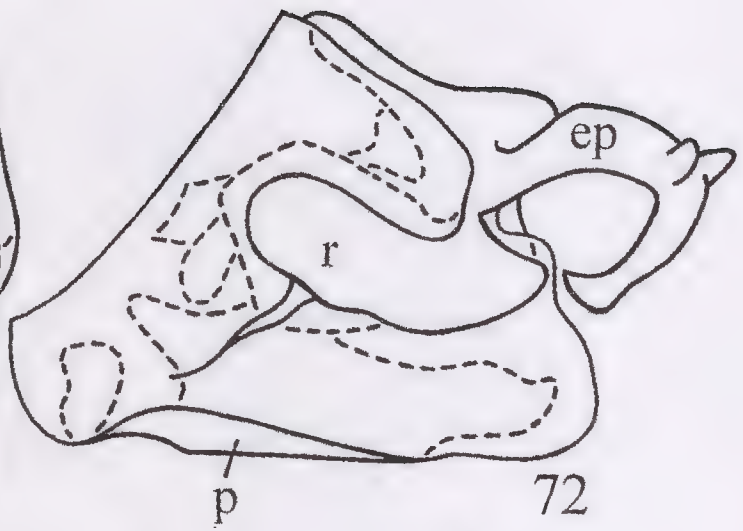
Figs 24-39. *Pteroplistes*, male. 24-27 - *P. lagrecai* sp. n.; 28-31 - *P. borneoensis* sp. n.; 32-35 - *P. acinaceus* Sauss. (lectotype); 36-39 - *P. sumatranus* sp. n. Genitalia from above (24; 28; 32; 36), from below (25; 29; 33; 37), and from side (26; 30; 34; 38); abdominal apex from above (27; 31; 35, without genital plate; 39). Abbreviations: **ap**, anal plate; **en**, endoparamere; **ep**, epiphallus; **gr**, guiding rod; **gp**, genital plate; **m**, mold of spermatophore attachment plate; **r**, ramus; **up**, upper process of guiding rod.

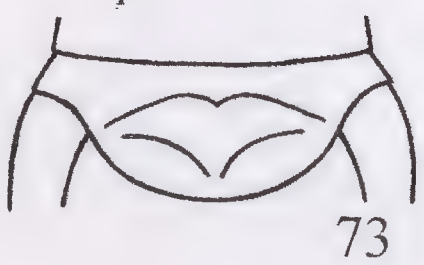


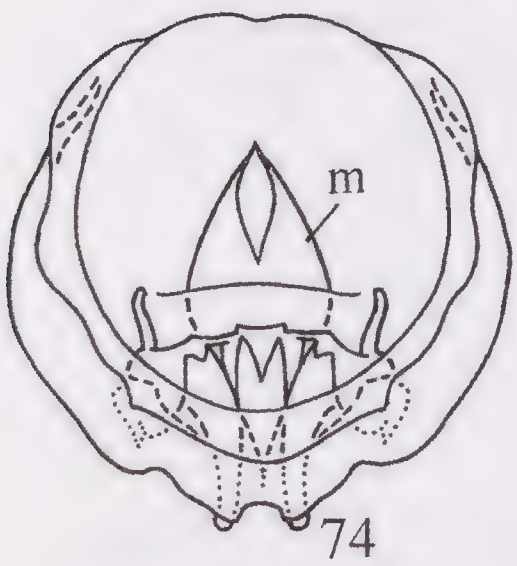
Figs 40-69. Pteroplistinae. 40-45 - *Kerinciola sonora* sp. n.; 46-52 - *Tramlapiola sylvestris* Gor. (46-51, holotype); 53-58 - *Tembelingiola plana* sp. n.; 59-64 - *Changiola subita* sp. n.; 65-66 - *Pangrangiola bona* sp. n. (holotype); 67-68 - *P. propria* sp. n.; 69 - *Crockeriola stolarczyki* Gor. et Kostia (holotype). Male genitalia from above (40; 46; 53; 59), from below (41; 47; 54; 60), and from side (42; 48; 55; 61); male abdominal apex without genital plate from above (45; 49; 58; 62); hind half of female (52) and male (all others) genital plate from below (43; 50; 52; 56; 65; 67; 69), from above (63), and from side (44; 51; 57; 64; 66; 68). Abbreviations: **e**, ectoparamere; **p**, additional plate-like sclerite; others as in Figs 24-39.

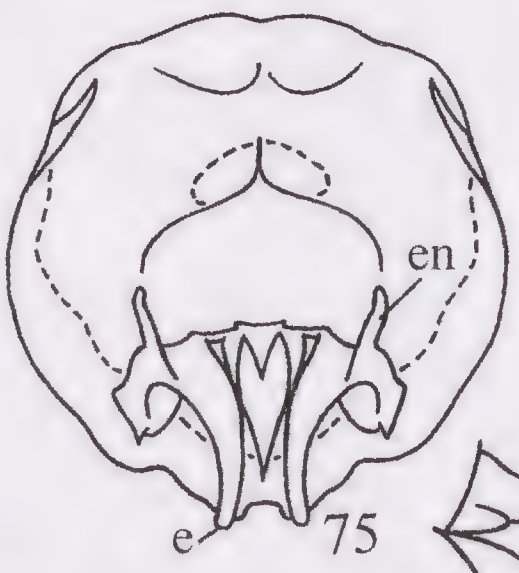


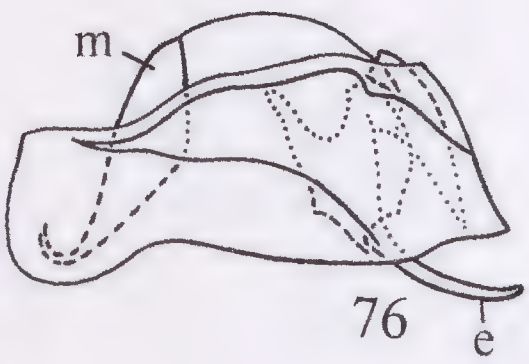


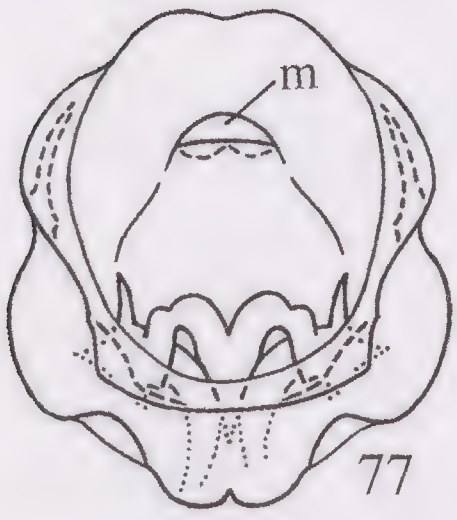


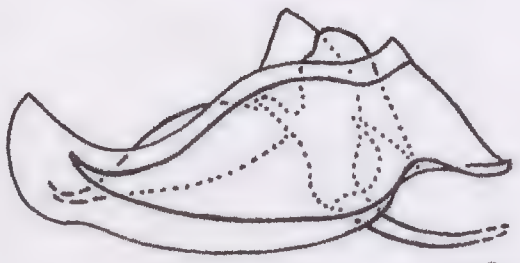




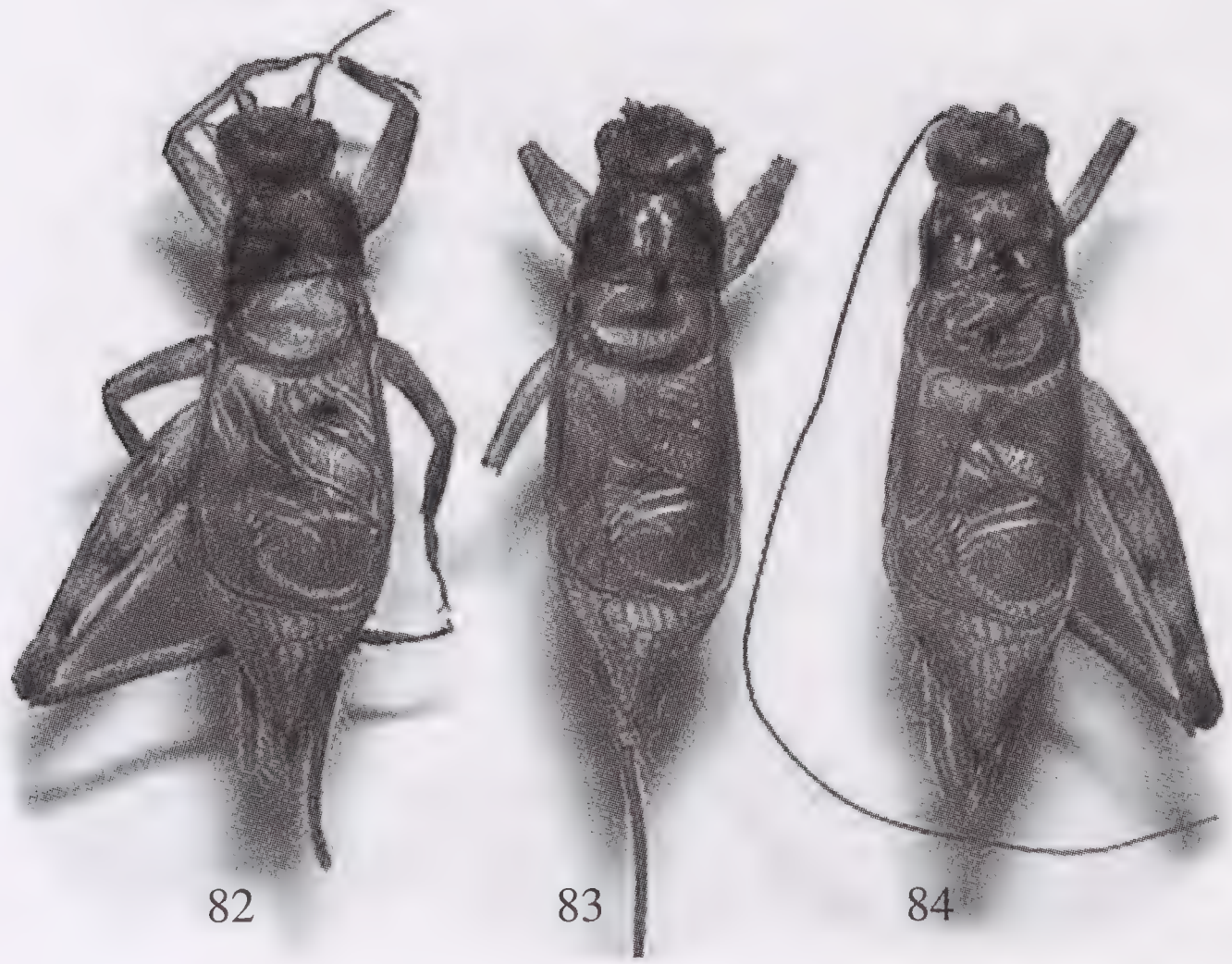








Figs 70-81. Pteroplistinae. 70-73 - *Crockeriola stolarczyki* Gor. et Kostia (holotype); 74-76 - *Pangrangiola bona* sp. n. (holotype); 77-81 - *P. propria* sp. n. Male genitalia from above (70; 74; 77), from below (71; 75; 78), and from side (72; 76; 79) [mold of spermatophore attachment plate in hind (74; 78; 79) and in normal (75; 76; 77) positions]; male abdominal apex without genital plate from above (73); ovipositor from side (80); female genital plate from below (81).



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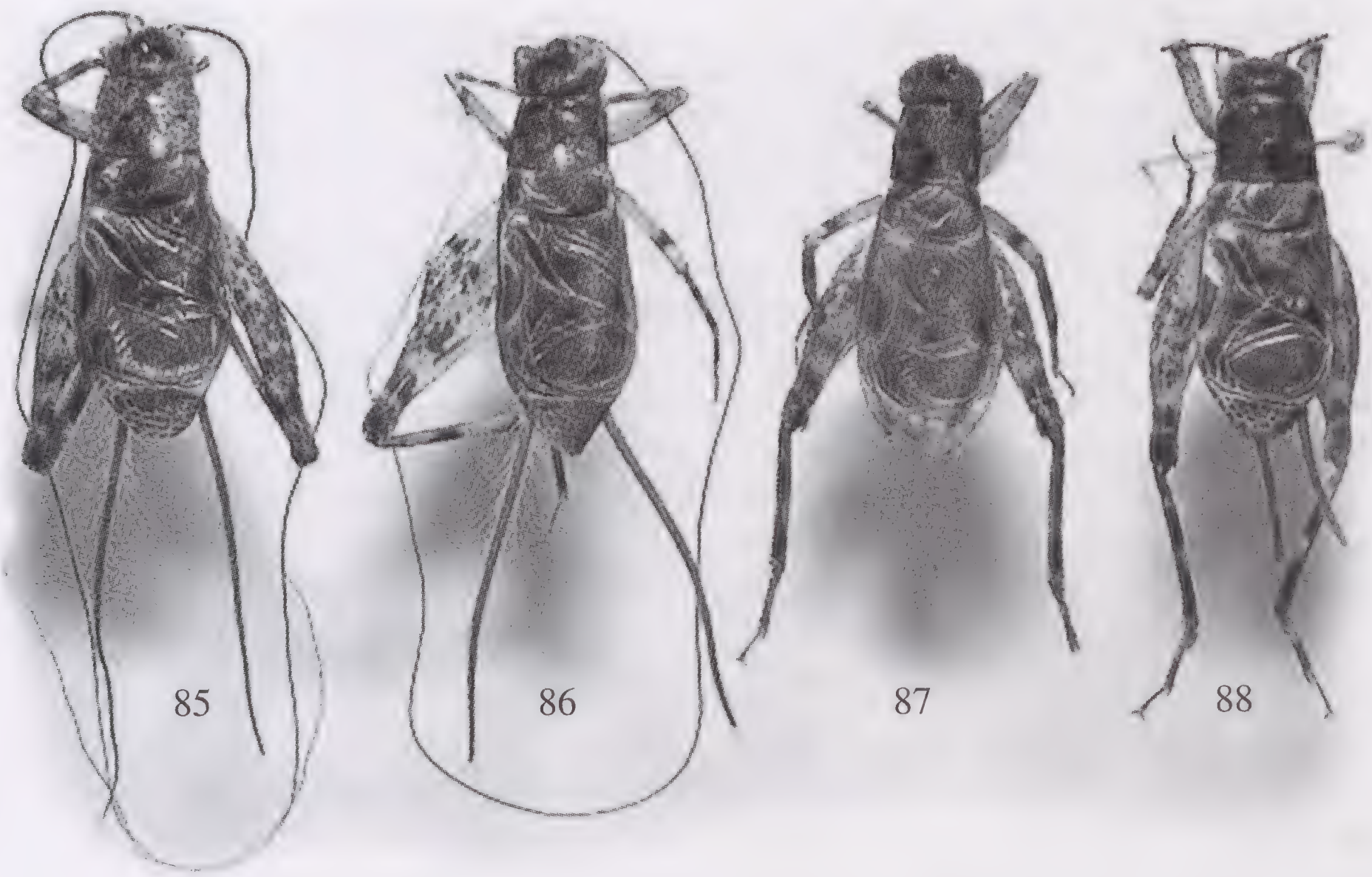

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Figs 82-88. General view from above, male (holotype). 82 - *Pteroplistes lagrecai* sp. n.; 83 - *P. borneoensis* sp. n.; 84 - *P. sumatranus* sp. n.; 85 - *Kerinciola sonora* sp. n.; 86 - *Tembelingiola plana* sp. n.; 87 - *Changiola subita* sp. n.; 88 - *Pangrangiola bona* sp. n.

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Memorie Soc. entomol. ital., 82 (2): 397-402 *30 giugno 2004*

Andrej V. GOROCHOV & Vicenta LLORENTE

Remarks on the genus *Megalotheca* and new species of *Conocephalus* (Orthoptera Tettigoniidae)

Abstract - Systematic position and composition of the genus *Megalotheca* are shortly discussed. Two stick-like species usually included in this genus are transferred to the genus *Conocephalus* Thunberg (*C. longiceps* (Peringuey) and *C. xiphidioides* (Karny)). Two new species closely related to them are described (*C. phasma* **sp. n.** (Tanzania) and *C. marcelloi* **sp. n.** (Madagascar)).

Riassunto - *Considerazioni sul genere* Megalotheca *e nuove specie di* Conocephalus (Orthoptera Tettigoniidae).
Gli Autori, dopo avere brevemente trattato la posizione sistematica e le specie afferenti al genere *Megalotheca* Karny, trasferiscono due specie nel genere *Conocephalus* (*C. longiceps* (Peringuey) and *C. xiphidioides* (Karny)). Infine descrivono due nuove specie strettamente affini ad esse, una della Tanzania (*C. phasma* **sp. n.**), l'altra del Madagascar (*C. marcelloi* **sp. n.**).

Key words: Conocephalinae, taxonomy, new species, Africa, Madagascar.

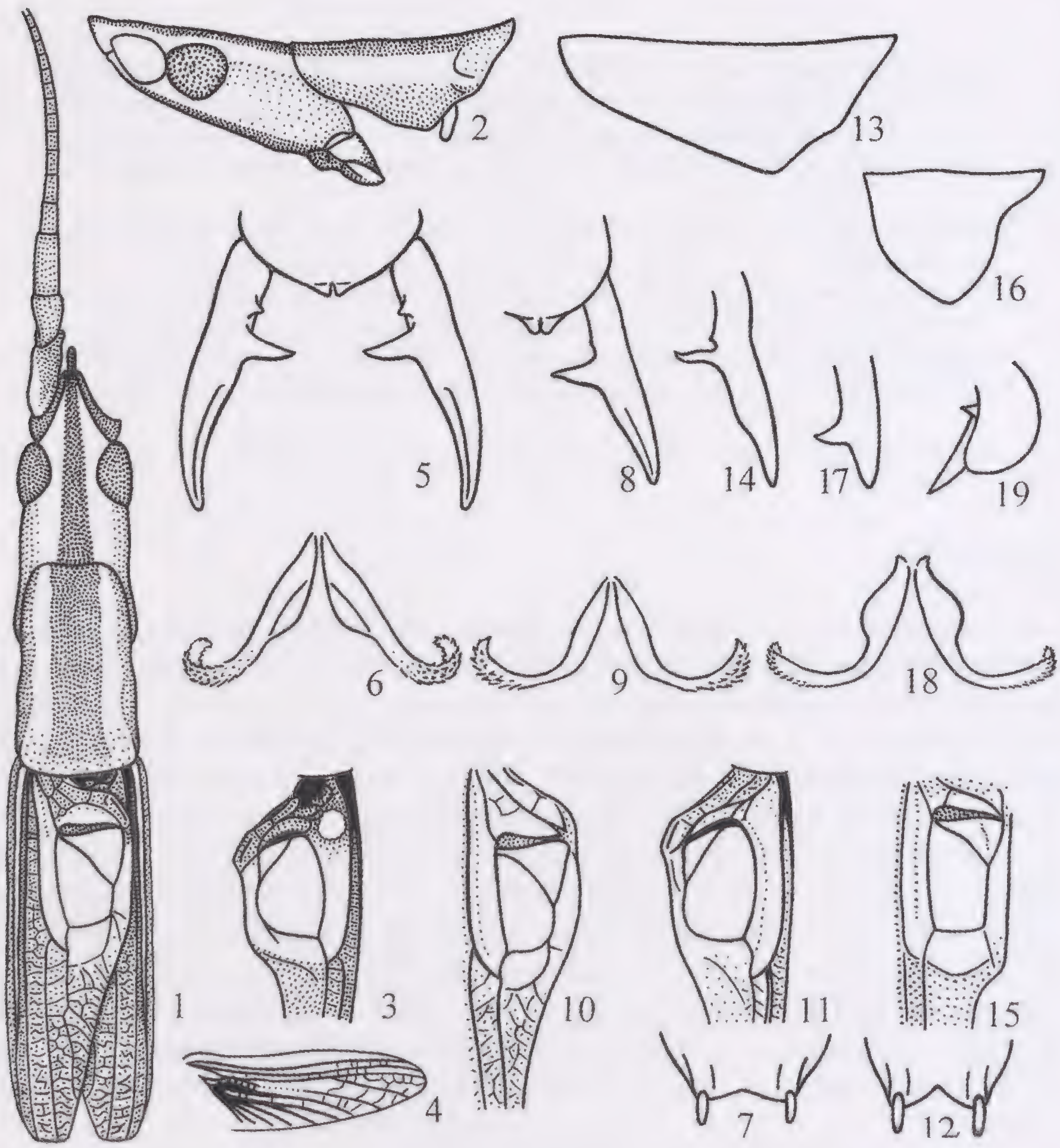
INTRODUCTION

According to Otte (1997), the genus *Megalotheca* Karny includes six species of stick-like Tettigoniidae from Africa and Madagascar. The opinions about the systematic position of this genus are rather diverse: Peringuey (1916), Uvarov (1928), and Otte (1997) considered it to be closely related to the genus *Conocephalus* Thunberg (Conocephalinae: Conocephalini); Karny (1907, 1912) put this genus into the tribe Agraeciini (Conocephalinae); Rentz (1979) suggested that it could belong to Saginae.

The position of the type species *Megalotheca vaginalis* Karny, 1907 (=*Xiphidion restiorum* Peringuey, 1916), *X. parvulum* Peringuey, 1916, and *M. montana* Uvarov, 1928 is to be considered problematical. In their general appearance they are somewhat similar to *Conocephalus*, but their male cerci are very different (fig. 19). At this moment, it is reasonable to keep the genus *Megalotheca* only for these South African species. *M. nigrifrons* Chopard, 1952 (Madagascar) presents a characteristic head rostrum: long, spine-like, with acute apex. It possibly belongs to Agraeciini or Euconchophorini (Conocephalinae).

X. longiceps Peringuey, 1916 (Zimbabwe) and *M. xiphidioides* Karny, 1907 (Madagascar), as well as two new similar species, are clearly closely related to *Conocephalus* species. They must be included in this genus (maybe as a separate subgenus) since all their important characters are very similar to those of true *Conocephalus*: the sructure of head rostrum (fig. 2), stridulatory apparatus (figs 1, 3, 10, 11, 15), male abdominal apex including 10^{th} tergite and cerci (figs 5, 8, 14, 17), and the shape of sclerites of male genitalia (figs 6, 9, 18). The differences in body shape between the majority of

Conocephalus species and these stick-like species are connected with life forms. The life form of the above-mentioned species is probably strongly adapted to the cryptic phytophilous life among grasslands. There are also some species with intermediate life forms: for example *C. rhodesianus* (Peringuey), whose pronotum is more or less intermediate between those in figs 2 and 16, and whose male cerci are almost as in fig. 8.



Figs 1-19. *Conocephalus* and *Megalotheca*, male. 1-7 - *C. phasma* sp. n. (holotype); 8-12 - *C. marcelloi* sp. n.; 13-14 - *C. longiceps* (Pering.) (Uvarov, 1928); 15 - *C. xiphidioides* (Karny) (Karny, 1907); 16-18 - *C. discolor* Thunb.; 19 - *M. vaginalis* Karny (Peringuey, 1916). Head, pronotum, and tegmina from above (1); head, pronotum, and acoustical stigma from side (2); stridulatory apparatus of lower (3; 11) and upper (10; 15) tegmina; hind wing (4); 10th abdominal tergite and cerci from above (5; 8, without left part); sclerites of genitalia (6; 9; 18); distal part of genital plate from below (7; 12); pronotum from side (13; 16); right cercus from above (14; 17; 19).

Systematic part

This paper is based on material from the following institutions: National Museum of Natural Sciences, Madrid (MNCN); Zoological Institute, RAS, S. Petersburg (ZIAS).

Conocephalus phasma sp. n. (figs 1-7, 20)

Holotype. Male, Tanzania, "Bukoba, Victoria Nyanza, 21.IV.912, Troitzkij" (ZIAS). Paratypes. 2 males, Tanzania, "Zanzibar, E. Deville", "*Terpandrus* Stal ?? spec.?" (MNCN).

Description. Male (holotype). Body narrow and long, stick-like. Coloration yellowish, with four longitudinal brown stripes: from rostral apex to hind edge of pronotal disc, along ventral side of head and lower parts of pronotal lobes. Head opistognathous, with very narrow rostrum and wide proximal segments of antennal flagellum. Pronotum long, but distinctly shorter than head; lateral lobes partly covering acoustical stigmae; their lower edge with fore part slightly S-shaped (figs 1, 2, 20). Fore and middle legs very short; hind legs long, with narrow femora. Tegmina shortened, extending to middle part of 4th abdominal segment, with narrowly round apex (fig. 20); stridulatory apparatus as in figs 1, 3; hind wings distinctly shorter than tegmina (fig. 4). 10th abdominal tergite with a pair of small tubercles at middle of hind edge; cerci long; their large medial hook situated in proximal half of cerci; medial denticle near it distinct; medial edge between this hook and cercal apex with middle part concave (fig. 5); genital plate with shallow hind median notch (fig. 7); sclerites of genitalia as in fig. 6.

Variations. Coloration of paratypes with only one brown upper stripe.

Female unknown.

Length (mm). Body 19-20; pronotum 3.6-3.8; tegmina 6.8-7.2; fore femora 2-2.2; hind femora 12.5-13.5.

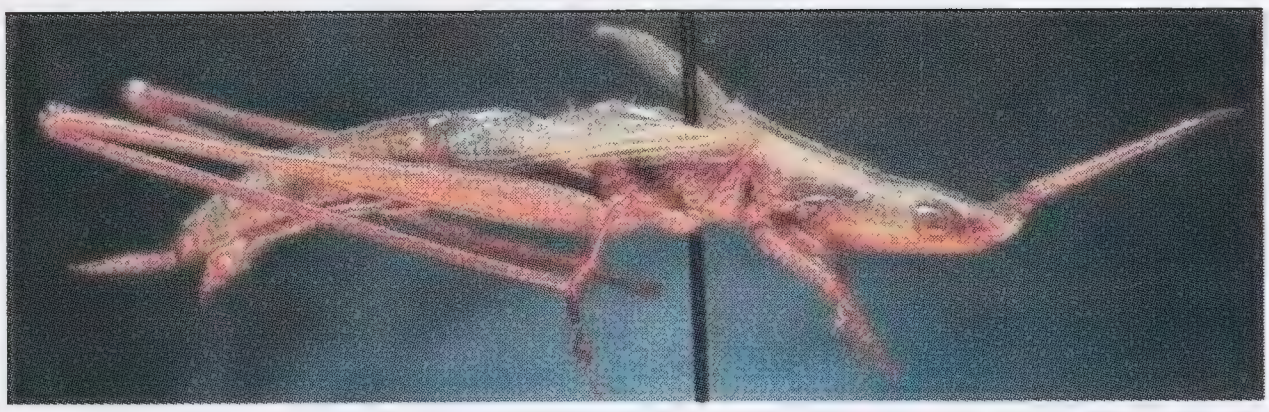
Comparison. *C. phasma* differs from *C. longiceps* in the shorter pronotum (length of hind femur/ length of pronotum = 3.5 in *C. phasma* and 3 in *C. longiceps*), the shape of lower edge of its lateral lobes (see figs 2, 13), and the shape of medial edge between large cercal hook and cercal apex (the middle part of this edge is concave in *C. phasma* and convex in *C. longiceps*; see figs 5, 14). This new species is distinguished from *C. xiphidioides* by the shorter mirror and the longer cell between stridulatory vein and mirror in upper tegmen (this cell is longer than half of the mirror in *C. phasma* and shorter than half of the mirror in *C. xiphidioides*) (see figs 1, 15) as well as the position of large cercal hook: in proximal half of cerci in *C. phasma* and in distal half in *C. xiphidioides*.

Derivatio nominis. *Phasma* – generic name of stick-insects.

Conocephalus marcelloi sp. n. (figs 8-12, 21)

Holotype. Male, Madagascar, "Sud de Madagascar, Ampandrandave, I.1932, A. Seyrig" (MNCN).

Description. Male (holotype). Body very similar to that of *C. phasma* including shape



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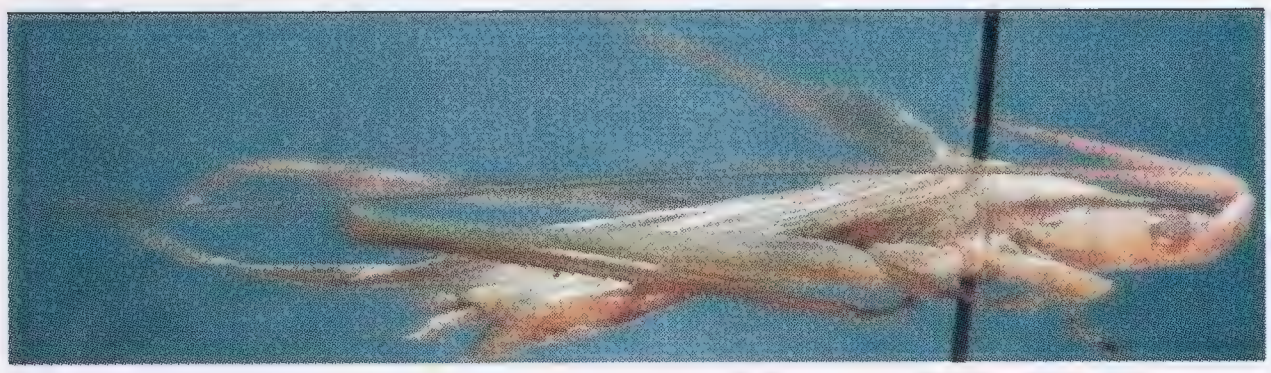

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Figs 20, 21. *Conocephalus*, general view of male from side. 20 - *C. phasma* sp. n. (holotype); 21 - *C. marcelloi* sp. n.

of head, pronotum, and legs. Coloration almost uniformly yellowish (possibly greenish in living condition), but with indistinct light brown stripe from rostral apex to hind edge of pronotal disc (fig. 21). Tegmina long, distinctly protruding beyond abdominal apex; their apex and stridulatory apparatus similar to those of *C. phasma*; hind wings much longer than tegmina (figs 10, 11, 21). 10th abdominal tergite and sclerites of genitalia also similar to that of *C. phasma* (figs 8, 9), but cerci distinctly shorter, their medial denticle (near large hook) somewhat smaller than in *C. phasma*, and genital plate with hind notch slightly deeper (figs 8, 12).

Female unknown.

Length (mm). Body 18; body with wings 25; pronotum 3.9; tegmina 16; fore femora 2.3; hind femora 13.

COMPARISON. *C. marcelloi* differs from *C. phasma*, *C. longiceps*, and *C. xiphidioides* in the completely developed wings and some other characters: from *C. phasma*, in the characters listed above; from *C. longiceps* and *C. xiphidioides*, in the same characters as *C. phasma*.

DERIVATIO NOMINIS. This species is named in memory of Italian orthopterist Prof. Marcello La Greca.

ACKNOWLEDGEMENTS

We thank Dr I. Izquierdo (MNCN), who gave the opportunity to study some specimens from the collections of the museum, B. Massa and P. Fontana, editors of this issue. This study was supported by the Russian Foundation for Basic Research (grant No. OO-04-48833).

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Klaus-Gerhard HELLER & Arne LEHMANN

Taxonomic revision of the European species of the *Poecilimon ampliatus*-group (Orthoptera Phaneropteridae)

Abstract - Among the European *Poecilimon* species *P. ampliatus, P. ebneri* (including *P. klisuriensis* **n. syn.** and *P. belasicensis* **n. syn.**), *P. marmaraensis* and *P. amissus* show many similarities. Because some of these similarities (e.g., shape and coloration of pronotum [fig. 6-11], structure of calling song [fig. 12]) can be considered as synapomorphic characteristics we postulate that these species are a natural group, the *Poecilimon ampliatus*-group. In addition, we demonstrate that *Poecilimon intermedius* is also a member of the *P. ampliatus*-group. It reproduces exclusively parthenogenetically, and as far as it can be examined, all known males were misidentified and belong to *P. fussi*. For the species of the group we give a list all known localities (except from *P. intermedius* outside Europe; see also fig. 13).

Riassunto - *Revisione tassonomica delle specie europee del gruppo di* Poecilimon ampliatus *(Orthoptera Phaneropteridae).*
Tra le specie europee del genere *Poecilimon*, *P. ampliatus, P. ebneri* (comprendendo *P. klisuriensis* **n. syn.** e *P. belasicensis* **n. syn.**), *P. marmaraensis* and *P. amissus* mostrano molte similarità. Poiché alcune di queste similarità (cioè forma e dimensioni del pronoto, struttura dei suoni di richiamo) possono essere considerate come caratteristiche sinapomorfiche, gli Autori suggeriscono che queste specie costituiscano un gruppo naturale, definito come gruppo-*Poecilimon ampliatus*. Viene inoltre dimostrata l'appartenenza di *Poecilimon intermedius* al citato gruppo di specie. Questa specie si riproduce esclusivamente per via partenogenetica e, per quanto è stato possibile osservare, tutti gli esemplari maschi finora attribuiti a *Poecilimon intermedius* devono invece essere riferiti a *P. fussi*. Per le specie del gruppo in questione viene fornita la lista delle località note, con esclusione di quelle extraeuropee di *P. intermedius*.

Key words: *Poecilimon*, taxonomy, song, distribution, *Poecilimon intermedius*, new synonymy.

In memoriam Prof. La Greca who examined also one of the species studied here in his papers (La Greca & Messina, 1979).

INTRODUCTION

The genus *Poecilimon* is one of the most species-rich genera of Orthoptera in the Palaearctis. Like the other members of the subfamily Barbitistinae all species are micropterous and not able to fly. This fact is certainly in part responsible for the high species number. According to the list given by Otte (1997) the genus contains 116 species, and continuously new species are described (e.g. Ünal, 2000; Sevgili, 2001). The status of many species and subspecies, however, has yet to be clarified. The phylogenetic relationships within this huge genus are also not well understood. In 1933, Ramme published the first revision of *Poecilimon*, establishing 8 groups for the 68 species known at that

time. However, he made no attempt of a cladistic analysis of the species and groups. 50 years later, Heller (1984) presented a cladogram about the relationships of 35 European forms using apomorphic characters. For a better understanding of the evolution of the genus, however, knowledge of the phylogenetic position of more species than previously known is necessary.

Because of the large number of species involved, we concentrate on studying small monophyletic groups and clarifying the relationships of the species involved. Lehmann (1998), for example, established a phylogenetic tree for the eight species of the *Poecilimon propinquus* group using information from mitochondrial DNA sequences.

In the present paper we focus on a small group of species near *P. ampliatus* Brunner von Wattenwyl, 1878. Ramme (1933) placed this species in his group VII together with many other small *Poecilimon* species. As we will show below, some of these species and some later described forms are more closely related to *P. ampliatus* than the others. We will call this group *P. ampliatus* -group despite the fact that *P. intermedius* (Fieber, 1853), also a member of this group, was described earlier than *P. ampliatus*. However, *P. intermedius* obviously propagates only parthenogenetically and no males are known (see below), so that many taxonomically important characters are unavailable in this species. In addition, the name *P. intermedius* -group was already used by Maran (1952) in another and - in our opinion - wrong combination.

MATERIAL AND METHODS

We have studied specimens preserved in the following collections: MNHB Museum für Naturkunde der Humbolt-Universität, Berlin, Germany; ZIN Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; CH (followed by the specimen code) Collectio Heller; CL Collectio Lehmann; CW Collectio Willemse. MNW indicates Naturhistorisches Museum, Vienna, Austria.

For most species additional references with taxonomically minor importance can be found in Otte (1997). They are not repeated here.

At http://www.dorsa.de all localities (except from Turkey) of specimens in CH can be visualised by a web-based GIS mapping tool (including lat/long data). At the same site digitised sound records are available under the sound file names given below.

Morphological structures were examined and photographed using a Wild photomicroscope. For sound recording in the field an Uher tape recorder 4200 IC with microphone Uher M645 was used (frequency response flat up to 20 kHz), in the laboratory a Racal store 4 D tape recorder with microphones Brüel & Kjaer 4133 and 4135 (frequency response flat up to 40 resp. 70 kHz). Oscillograms and sound analysis were made using a PC and the programs Turbolab (Stemmer AG) and CoolEdit. Wing movements were registered by an opto-electronic device (Heller, 1988).

Bioacoustic terminology:

Calling song: spontaneous song produced by an isolated male. Syllable: the song produced by one opening-closing movement cycle of the tegmina. Impulse: a simple, undivided, transient train of sound waves arising by the impact of one tooth of the stridulatory file.

Results

Characteristics of the *Poecilimon ampliatus* -group. From a direct comparison with most European *Poecilimon* species (e.g., Heller, 1984, 1988; Willemse & Heller, 1992; Heller & Reinhold, 1992; Lehmann, 1998; unpublished studies) and from literature studies it became evident that a group of species of this genus can be separated from its congenerics and recognised by the following characters:

1) cerci typically with one to three, only in single individuals more teeth
2) relatively small to medium body size compared to other *Poecilimon* species
3) small spiracles
4) elytra of female very small, not overlapping
5) long, narrow, slender subgenital plate in the male
6) basal fold of upper ovipositor valve inflated
7) pronotum with pinkish markings (red or brown in *marmaraensis*), typically on both edges as well as in the middle, and with middle keel
8) body colour greyish green, even in larvae
9) song: long uninterrupted sequence of syllables, in some species up to many seconds

Not all of these characterics are autapomorphic characters of the *Poecilimon ampliatus* -group. The low number of cerci teeth (1) comes close to the plesiomorphic condition of *Poecilimon* consisting of single-toothed cerci (similar as in *P. ampliatus*; see fig. 1). The small body size (2) is difficult to evaluate concerning the direction of evolution. The characters (3)-(4) are apomorphic characters of a relatively large number of *Poecilimon* species and have evolved probably at least three times independently in this genus. Stumpner & Heller (1992) give a description of the differences in spiracle size in *Poecilimon* and of the consequences for hearing. Among the European species characterised by (3) and (4) a long, slender subgenital plate (5) is found only in the *Poecilimon ampliatus* -group. In addition, the lateral sclerits of the upper ovipositor valve are concave in these species (characterised by 3 and 4) forming a leading groove with a bulb at the lower border, while in females of the *P. ampliatus*-group they are convex or inflated without bulb (fig. 2-5). Only *P. orbelicus* Pancic, 1883 is similar to the *P. ampliatus*-group in the shape of the lateral sclerits and the length of the male subgenital plate. Interestingly, preliminary results from DNA sequencing also indicate a close relationship of this species to members of the *P. ampliatus*-group (Pollmann & Reinhold, unpublished).

Shape and coloration of the pronotum (7) differ from all other European *Poecilimon* species (see fig. 6-11). The same is true for the body colour (8; see fig. 6-11) and for the song structure (9) (fig. 12).

According to this combination of characters, the following five European species belong to one monophyletic group. Heller (1988) considered three forms (*P. ampliatus, ebneri* and *klisuriensis* [here synonymized with *P. ebneri*]) as members of one superspecies.

1) *Poecilimon ampliatus* Brunner von Wattenwyl, 1878
2) *Poecilimon ebneri* Ramme, 1933 (including *P. klisuriensis* Willemse, 1982 **n. syn.** and *P. belasicensis* Popov, 1996 **n. syn.**)

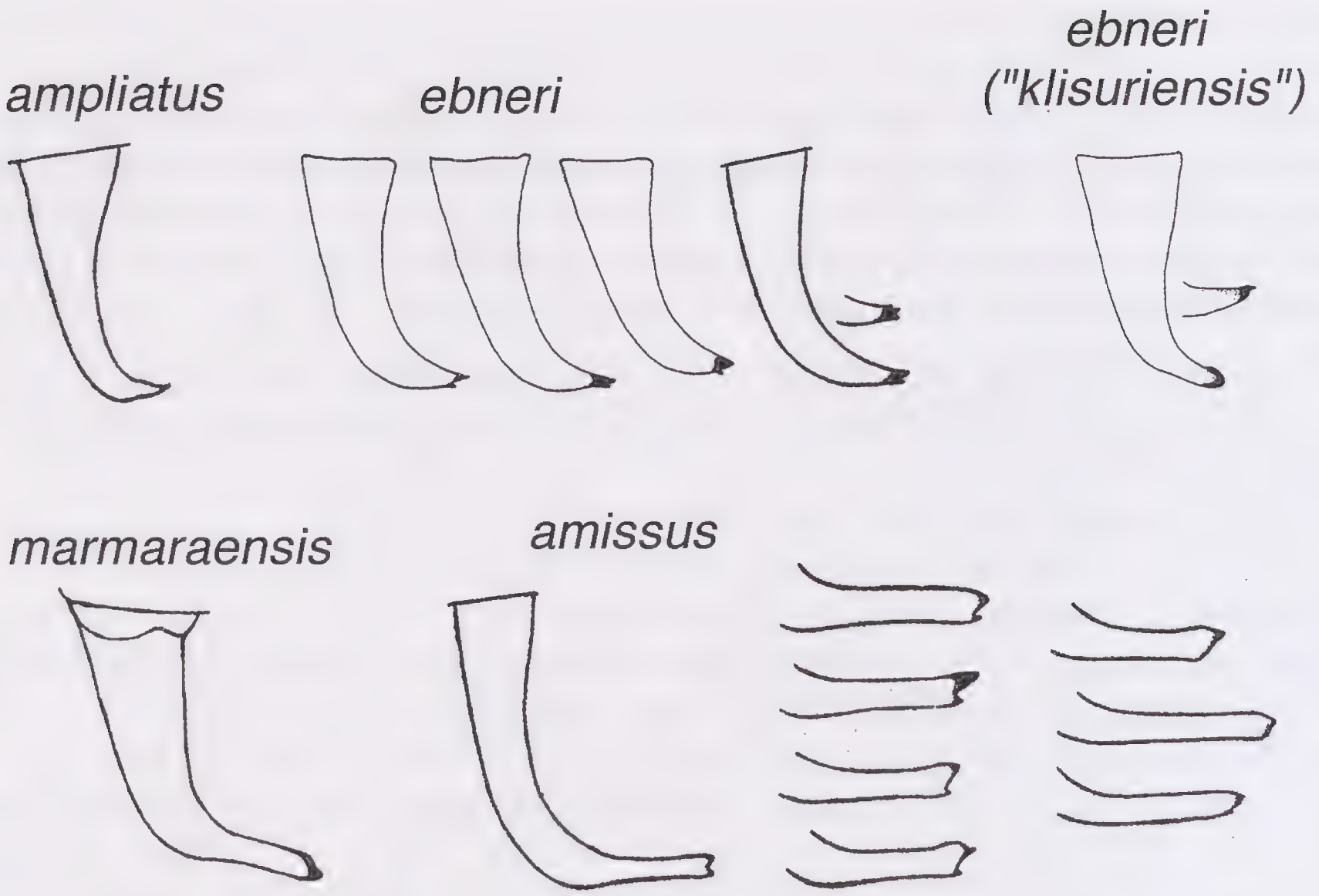


Fig. 1. Left male cercus of *Poecilimon ampliatus* (from Ramme, 1933), *P. ebneri* (from Willemse, 1982), *P. marmaraensis* (from Naskrecki, 1991), and *P. amissus* (from Ramme, 1933).

3) *Poecilimon marmaraensis* Naskrecki, 1991
4) *Poecilimon amissus* Brunner von Wattenwyl, 1878
5) *Poecilimon intermedius* (Fieber, 1853)

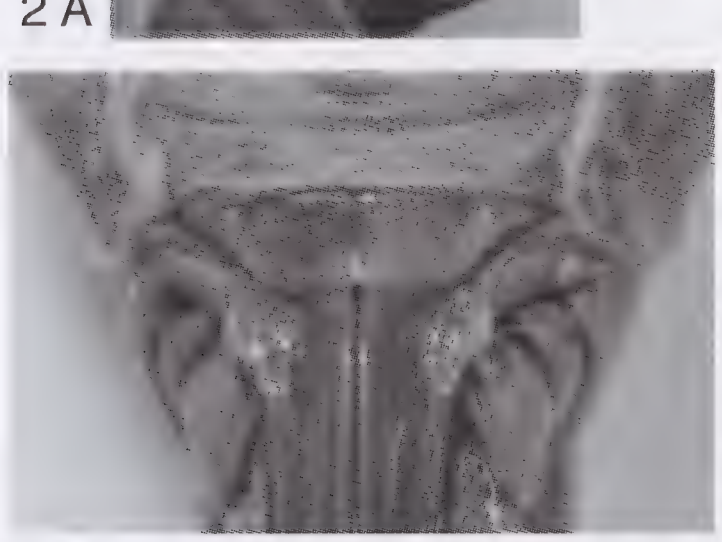
DISTRIBUTION RANGE: Balkan, western Turkey (see fig. 13), only *P. intermedius* also large parts of palaeartic Asia.

DESCRIPTION OF SPECIES

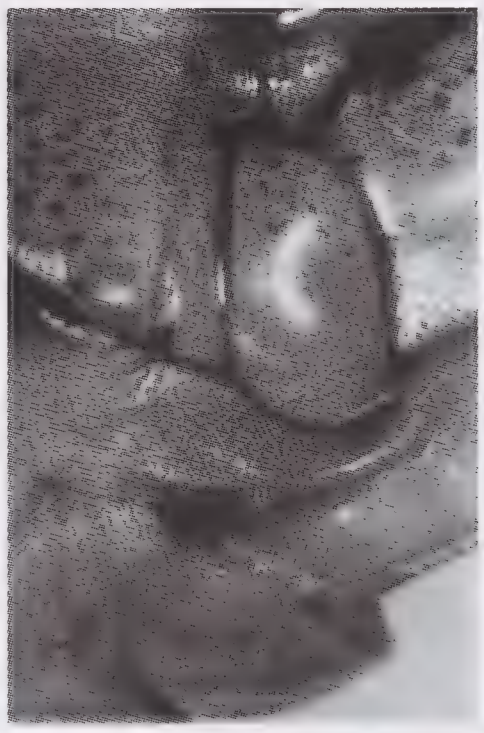
1) *Poecilimon ampliatus* Brunner von Wattenwyl, 1878
(Brunner von Wattenwyl, 1878: 38, 46; locus typicus: Slovenia, Krain, St. Peter. Type material: MNW, No. 11912 (fide Otte 1997))

MATERIAL EXAMINED: Slovenia: St. Peter/Karst: 1♂ (MNHB) (labelled: Co-Typus (Ramme's Handschrift)[red]// Coll. Br.v.W./Br.v.W. leg./St. Peter (Karst) 10.Juli//det Br. v.W./P. ampliatus Br.), 1♀ (MNHB) (labelled: Krauss/St. Peter/2.Juli/1877.III); Krain Planina: 1♀ (MNHB) (labelled: Krain/Planina/ 26.8-5.9.12/W.Ramme); Grice (15 km northeast of Triest): 1♂, 1♀ (CH0041, 0062; V.1986/leg. E. Blümm); Istria, surroundings of Slavnik: 2 ♂♂ (CH1666-1667; VI.1983/leg E. Blümm/ sound record A)
Montenegro: Pepicic, Hayla Planina 2♂♂ (MNHB) (labelled: Montenegro/Pepicic, Hayla Pl./8.-10.7.38/Zwick-Roehl); Durmitor: 6♂♂, 3♀♀ (CH0408, 1658-1665; 28.VII.1982/leg K.-G.

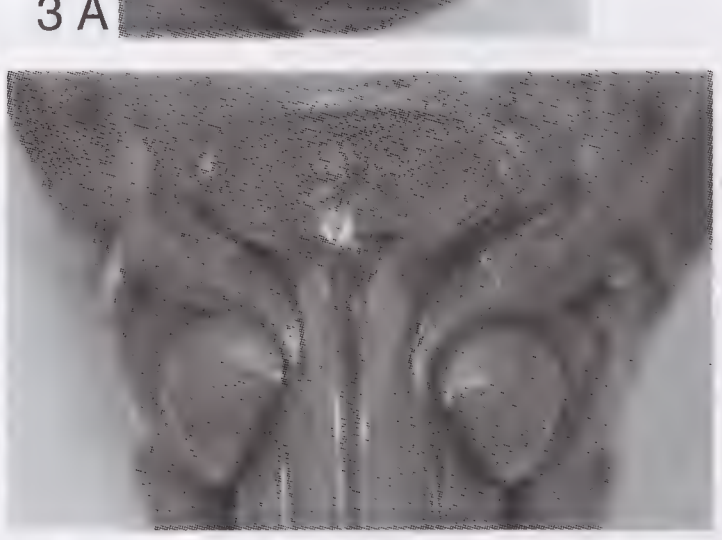
2 A



2 B



3 A



3 B

4 A

4 B

5 A

5 B

Figs 2-5. Left male cercus of: 2 - *Poecilimon ampliatus* (from Ramme, 1933); 3 - *P. ebneri* (from Willemse, 1982)*; 4 - P. marmaraensis* (from Naskrecki, 1991); 5 - and *P. amissus* (from Ramme, 1933).

Heller/sound record B); above Cakor pass near Gusinje, 2000 m a.s.l.: 1♂ (CH2442, 18.VI-II.1988/leg. K. Reinhold)

SOUND RECORDS:

A CH1667, laboratory recording, 23°C, sound files POAP8301-11 (fig. 12)

B CH1658 or another specimen from this population, field recording, 19 °C, sound files POAP8201-04

LIST OF KNOWN LOCALITIES: *P. ampliatus:* Slovenia: St. Peter (Pivka): *locus typicus* Krauss 1879, Brunner von Wattenwyl 1878 (quoted by Brunner von Wattenwyl, 1882; Redtenbacher, 1900; Karny, 1907; Ramme, 1939; Us, 1971); Planina: Ramme, 1913 (Bey-Bienko, 1954; Us, 1971); Grize 15 km northeast of Triest: this paper; Nanos: Us, 1972. Istria: Mt Maggiore (=Ucka) Redtenbacher 1900 (Karny, 1907; Bey-Bey-Bienko, 1954), Bellmann, 1993; surroundings of Slavnik: Heller, 1988. Bosnia-Herzegovina: Cemerno: Miksic, 1973; Messina et al., 1975; Zelengora: Miksic, 1973; Lebrsnik: Miksic, 1967; Igman-Palez (=Igman mt): Miksic, 1967; Cincar: Miksic, 1967 (Miksic, 1978). Serbia: "Im serbischen Gebirge"[1]: Brunner von Wattenwyl, 1882 (not localised and not in map); Hailer Planina near Pec: Ramme, 1939, Pavicevic & Karaman, 2001; Sula Planina: Pancic, 1883 (Bey-Bienko, 1954; Adamovic, 1975); Zlatibor, Partizanske Vode: Ingrisch (unpublished), Pavicevic & Karaman, 2001; Tara Mt, Zaovine: Ingrisch (unpublished), Pavicevic & Karaman, 2001; Mount Golija: Stevanovic, 1953 (Adamovic, 1975). Montenegro: Durmitor: Willemse, 1966; Us, 1968; Heller, 1988; Ingrisch & Pavicevic (several localities; unpublished ms); Bobotov Kuk (Durmitor): Us, 1968; Niksic: Us, 1968; Kapetanovo jezero (Stocak): Us, 1968; Bor bei Gusinje: Us, 1968; Cakor pass near Gusinje: this paper; Sekular-Kostris: Bey-Bienko, 1954 (Us, 1968; Cejchan, 1981). Rumania: Muntii Apuseni: Kis, 1964 (Kis & Vasiliu, 1970; Kis, 1978).

MORPHOLOGY. The most characteristic morphological feature of *P. ampliatus* is the large tubercle on the first abdominal tergit (fig. 14). It may represent Hancock's alluring gland and has obviously evolved independently to this size in several, not closely related *Poecilimon* species (*P. glandifer* Karabag, 1950, *P. erimanthos* Willemse & Heller, 1992) and other genera of the Barbitistinae (in all species of the genera *Polysarcus, Phonochorion* and *Artvinia*). In *P. erimanthos* (and most other species) the tubercle is located on the second abdominal tergit, in *P. glandifer* on the first as in *P. ampliatus*.

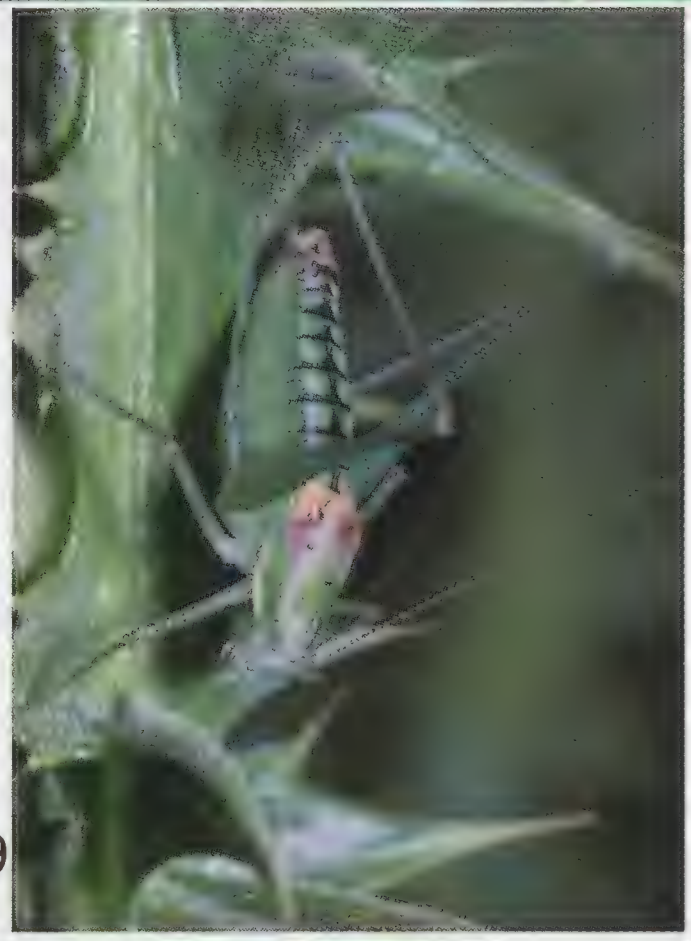
SONG. The song consists of long, uninterrupted sequences of syllables (duration of 2 to 4 s recorded) each consisting of about 10 impulses. The syllables were produced at a rate of 11-14 Hz (T>23°C) (Heller, 1988). The sound is produced during the closing movement of the elytra (fig. 12). The frequency spectrum shows a peak at 37 kHz (18 kHz - 45 kHz 18 dB below peak). Ingrisch & Pavicevic (ms) describe a very similar song pattern: syllable sequences of 45-60 syllables, each syllable consisting of 7-10 pulses. Syllable repetition rate is 13-14 per second (at 26°C).

DISTRIBUTION: see fig. 13. Note the isolated occurrence in Rumania.

2) *Poecilimon ebneri* Ramme, 1933
(Ramme 1933: 542; locus typicus: Pashtrik, Albania. Type material: MNW)
[syn.] *ebneri* var. *peristericus* Karaman, 1961; syn. of *Poecilimon ebneri*: Willemse 1982: 174
(Karaman, 1961: 41; locus typicus: Macedonia: Perister. Type material: Museum Macedonicum

6

7



8

9

10

11

Fig 6-11. Adult animals: 6 - *Poecilimon ampliatus* male (Montenegro, Durmitor, 28.07.1982); 7 - *Poecilimon marmaraensis* male (European Turkey, 1996); 8 - *Poecilimon ebneri* male (Greece, Vevi near Florina, 1.07.1980); 9 - *Poecilimon amissus* male (Greece, Lesvos, Vrissa, 23.05.1993); 10 - *Poecilimon amissus* female (Greece, Lesvos, Vrissa, 23.05.1993); 11 - *Poecilimon intermedius* female (Russia, Kaluga district, Obninsk, Konchalovskie gory, leg. A. Benediktov, 1996).

scientiarum naturalium, Skopje)
According to the Zoological Code (4th edition, 1999) infrasubspecific names are not available if they were published after 1960. Obviously Karaman intended to describe a geographic population ("Die mazedonischen Exemplare teile ich als var. *peristericus* n. var. von der typischen Art ab") comparable to a subspecies. According to Art. 45.6.4.1 the name was made available by Harz (1969) who adopted it as a valid name of a subspecies *Poecilimon ebneri peristericus* Karaman, 1961 (Harz, 1969: 141).
[syn.] *bulgaricus* Andreeva, 1980; **n. syn.**
(Andreeva, 1980: 107; locus typicus: Bulgaria, Belasitsa Mts Radomir peak "Demir Kapiya". Type material: National Natural History Museum, Sofia (paratypes)
Primary homonym of *P. bulgaricus* Brunner von Wattenwyl, 1891, which is a synonym of *orbelicus* Pancic, 1883 (Popov, 1997)
[syn.] *belasicensis* Popov, 1997; **n. syn.**
Replacement name for *bulgaricus* Andreeva, 1980
[syn.] *klisuriensis* Willemse, 1982; **n. syn.**
(Willemse, 1982: 174; locus typicus: Greece, Klisoura. Type material: CW)

MATERIAL EXAMINED: Albania: Pashtrik, 4.-14.7.1918, 1♂, 1♀ (MNHB) (labelled: Paratypi [red]//Alban.Exp. '18/Pashtrik, 4-14.7. [white])
Greece: N. Florina: Vernon Mts above Pisodherion: 3♂♂, 2♀♀ (CH1635-39, 20.VII.1978/leg. K.-G. Heller/ sound record A), 3♂♂, 2♀♀ (CH1640-44, 3/4.VIII.1979/leg. K.-G. Heller & M. Volleth); 3♂♂ (CH1645-46, 1653, 11.VIII.1981/leg. K.-G. Heller & M. Volleth); 5♂♂, 1♀ (CH1647-51, 1655, 30.VII.1982/leg. K.-G. Heller); Vevi, southeast of Florina, 800 m a.s.l.: 4♂♂ (CH0491, 1654-56, 30.VI.1980/leg. K.-G. Heller & M. Volleth/ sound record B); west of Limni Petro, (1995-1996; CL); south of Sitaria (1995; CL); west of Florina, Vernon mt (1994-1996; CL); N. Kastoria: Vernon Mts above Drossopigi: 3♂♂, 2♀♀ (CH2388-2392, 31.VII.1987/leg. K.-G. Heller); above Klisoura (type locality of *P. klisuriensis*): 9♂♂, 6♀♀ (CH0003-7, 0121-129, 0151, 28.VI.1986/leg. K.-G. Heller /sound record C); 3♂♂, 3♀♀ (CH2437-41, 25.VI.1988/leg K.-G. Heller/sound record D)
Bulgaria: four paratypes of *bulgaricus* Andreeva, 1980: Belasitsa/Demir Kapia/23.viii.1977/Andreeva Ek (2♂♂, 1♀)/Peshev, G. (1♂) (in Bulgarian); Belasitsa mt, the ridge of the mountain, peak Maluk kongur, place Demir Kabiya (1700-1950 m a.s.l.): 3♂♂, 2♀♀ (CH5833-37, 23.VI-II. 2000, leg. D. Chobanov)

SOUND RECORDS:
A CH1635, field recording, 11°C, sound file POEB7801
B CH1656 or other specimens from this population, field and laboratory recordings, sound files POEB8001-27
C CH0151 or another specimen from this population, laboratory recordings, 18°C, sound files POKL8601-2,4-6 (fig. 12)
D CH2338 or another specimen from this population, laboratory recordings, 23°C, sound file POKL8801
E Greece, Grevena, Mt.Vourinos, 25.06.1986, laboratory recordings, 21°C, recorded by Fer Willemse (Heller, 1988) (fig. 12)

LIST OF KNOWN LOCALITIES: Albania: Pashtrik (Beshtriku): *locus typicus* Ramme 1933 (Karaman, 1961; Cejchan, 1963; Harz, 1969; Adamovic, 1975); Mali i Gjalicës: Csiki, 1923 (fide Cejchan, 1963). YU-Macedonia: Perister: Karaman, 1961 (Cejchan, 1963; Harz 1969), Willemse, 1982;

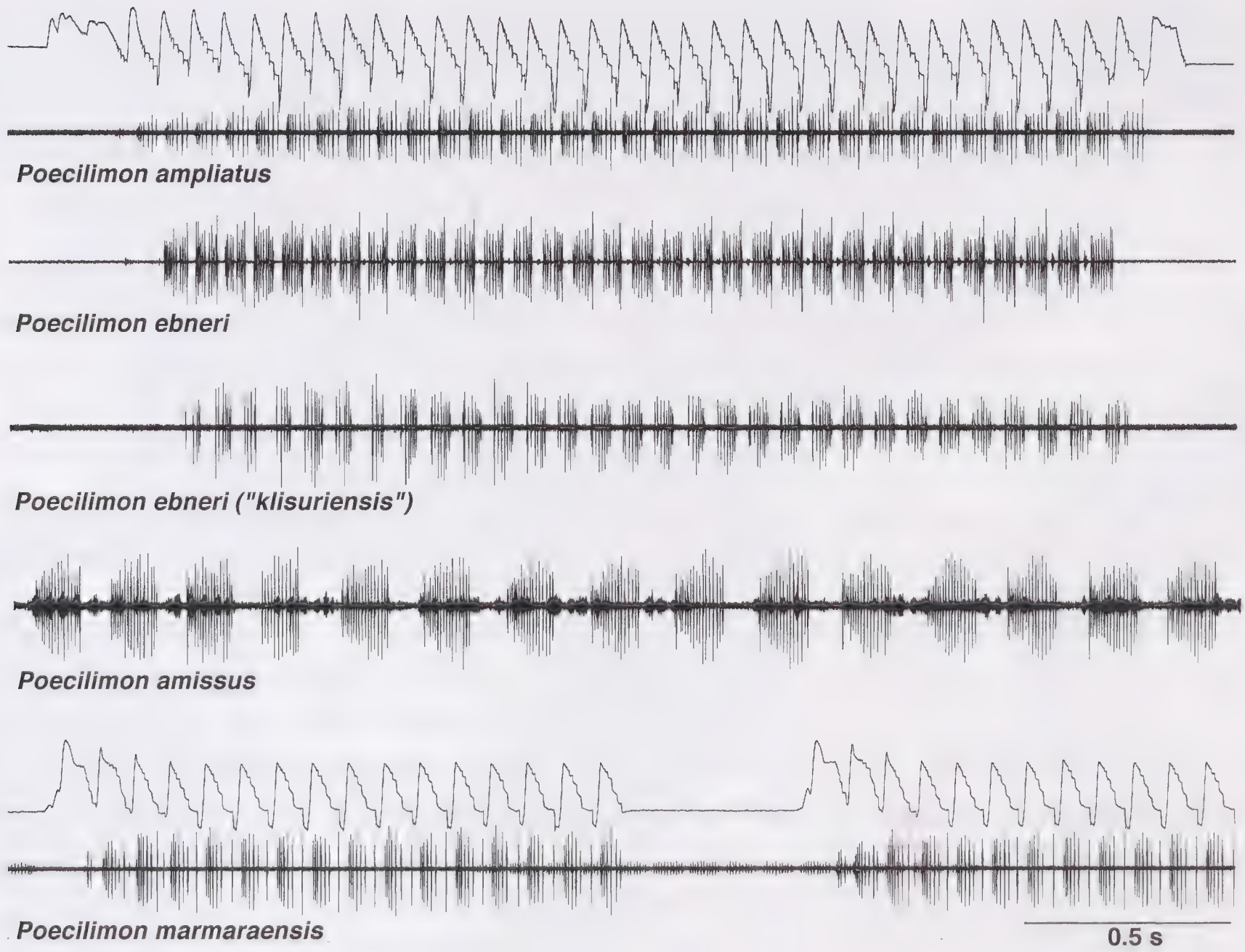


Fig. 12. Calling song of species of the *Poecilimon ampliatus*-group (synchronous registration of left elytron movement [in *ampliatus* and *marmaraensis* only; upward deflection represents opening, downward closing] and oscillograms of sound, details of recording see Description of species).

Bulgaria: Belasitsa: Andreeva, 1980 (as *P. bulgaricus*) (Popov, 1997 [as *P. belasicensis*]). Greece: Mt Vermion: Willemse, 1982 (Willemse, 1984); Mt Vernon: Willemse, 1977 (Willemse, 1982, 1984), Heller, 1988; Mt Smolikas Willemse, 1977 (Willemse, 1984); east of Florina (Vevi): Heller, 1984 (Heller, 1988); above Drossopigi: this paper; Grevena, Vourinos mts: Heller, 1988 (Willemse leg.); west of Limni Petro: this paper; south of Sitaria: this paper; west of Florina: this paper; Klissoura: *locus typicus* of *P. klisuriensis* Willemse, 1982 (Willemse, 1984); Heller, 1988.

MORPHOLOGY. Examining specimens from one locality, Ramme (1933) described the cerci of the new species *P. ebneri* as having two teeth, a large and a small one. However, already Karaman (1961) mentioned that this character is variable, finding animals with only one cercus tooth. Willemse (1982) documents the variability of the tip of the cercus in a series of figures (p. 170: fig. 60-62). Checking relatively large series from several localities we show that number of teeth per cercus indeed varies widely (fig. 15), ranging from 2-4, although we did not find cerci with only one single tooth as did Karaman (1961). The number of teeth is even quite often different between left and right cercus of one individual (see fig. 15), without any preference for one side. *P. klisuriensis* was described by Willemse (1982) according to one male and three females, differing

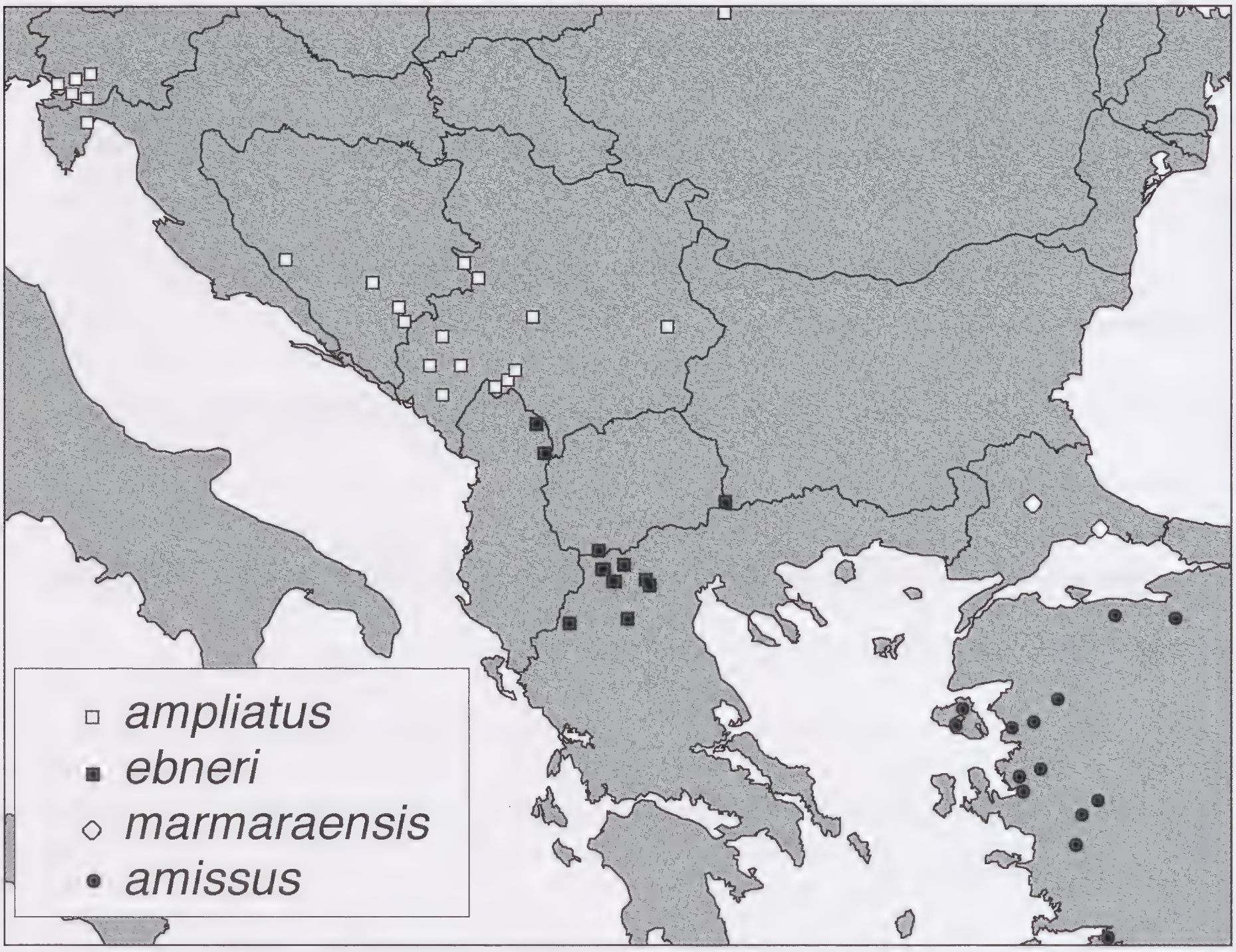


Fig. 13. Distribution records of the European species of the *Poecilimon ampliatus*-group (except *P. intermedius*; for details see Description of species).

from *P. ebneri* mainly in the shape of the tip of the cercus. Although this difference is easy to recognise and the characteristical shape is also found in our topotypical material, we consider - taking into account the high variability of the diagnostic character - *P. klisuriensis* only as a local form of *P. ebneri.*

SONG. The song was very similar to that of *P. ampliatus* (Heller, 1988). It consisted of long, uninterrupted sequences of syllables (duration 1 to 6 s (most often 2-3 s), at low temperature more than 20 s recorded). The syllables were produced at a rate of 9-14 Hz (T>23°C) (Heller, 1988) (fig. 12). The frequency spectrum showed a peak at 30 kHz (17-50 kHz 18 dB, 22-43 kHz 12 dB below peak). The same song structure was found at the type locality of *P. klisuriensis* (duration 1-5 s; syllable repetition rate 10-15 Hz at 18->23°C; peak of frequency spectrum 24 kHz (24-45 kHz 18 dB below peak)).

DISTRIBUTION: see fig. 13

3) *Poecilimon marmaraensis* Naskrecki, 1991

(Naskrecki, 1991: 159; locus typicus: Turkey, 20 km East of Tekirdag. Type material: Poland, Akademia Nauk, Institute of Zoology, Warsaw)

MATERIAL EXAMINED: Turkey (European part): Tekirdag: 20 km east of Tekirdag (near Yenciftlik, 500m from coast): 1♂, 1♀ (CH4601-2, Mai 1996/leg. H. Braun/ sound record A); Tekirdag: 15 km south of. Çorlu (roadside): 5♂♂, 4♀♀ (CH4584, CH4590-6, CH4607, Mai 1996/leg. H. Braun/ sound record B); Kirklareli: 10 km west of Lüleburgaz (branching off to Saricaali): 6♂♂, 3♀♀ (CH4581-3, CH4585-6, CH4603-6, Mai 1996/leg. H. Braun/ sound record C)

SOUND RECORDS (all laboratory recordings, 23-25°C):
A CH4601, sound files POMA9606, 14-15
B CH4584, sound files POMA9605,10; CH4591, sound files POMA9601-2; CH4592, sound files POMA9603-4, 8-9,13 (fig. 12); CH4593, sound file POMA9607
C CH4581, sound files POMA9611-12, 16, 21; CH4586, sound files POMA9617-18; CH4603, sound files POMA9619-20

MORPHOLOGY. The species shows all characters of the *P. ampliatus*-group. The stridulatory file bears about 80 teeth (CH4581), being intermediate between *P. ebneri* (60-70) and *P. ampliatus* (95) (Heller 1988).

SONG. The calling song of all recorded specimens and localities was quite similar. It consisted of uninterrupted sequences of syllables with duration of about 1-2 s, rarely 3 s (fig, 12). The syllable repetition rate was 10-13 Hz (at T=23-25°C). Each syllable contained on average 8-20 impulses. During one recording session the impulse number of each animal was quite constant, and also the variation between different registrations of the same animal seemed to be smaller than between animals. The frequency spectrum showed a peak at 31-33 kHz (21-46 kHz 18 dB below peak).

DISTRIBUTION: Known only from some localities in European Turkey (fig. 13). Recently the species was found in Bulgaria (D. Chobanov, pers. communication)

4) *Poecilimon amissus* Brunner von Wattenwyl, 1878
(Brunner von Wattenwyl, 1878: 44; locus typicus: Turkey, Bosdagh near Izmir (Smyrna). Type material: MNW No. 8144 (fide Otte 1997))
[syn.] *smyrnensis* Brunner von Wattenwyl, 1891: Ramme 1933: 546
(Brunner von Wattenwyl, 1891: 26, 29; locus typicus: Turkey, Izmir (Smyrna). Type material: MNW syntypes ♂, ♀ (fide Otte 1997))

MATERIAL EXAMINED: Greece: Lesvos/Mytilini: Klopedi (north of Kaloni), 1♂ (CH3006, 25-27.May 1993/leg. K.-G. Heller); near Vrissa, near remainings of castle, 9♂♂, 3♀♀ (CH2966-70, CH2972-78, 23.May 1993/leg. K.-G. Heller/ sound recording)
Turkey: Smyrna 1♂ (MNHB) (labelled: Paratypus [red]//coll. Br.v.W./Smyrna/Br.v.W.//det Br.v.W./*Poecilimon smyrnensis*), 1♀ (MNHB) (labelled: Krüper [white]), Olymp bei Brussa; 1♂ (MNHB) (labelled: Olymp b. Brussa/8.1937/Frl. Neuhäuser [white])

SOUND RECORDS:
Field and laboratory recording, 19°C, 23,5°C; sound files POAM9301-08 (fig. 12)

LIST OF KNOWN LOCALITIES: Greece: Lesvos, Klopedi (north of Kaloni): this paper; Lesvos, Vrissa: this paper (the note in Heller et al. [1998] refers to these Greek records)
Turkey: Bos Dagh: *locus typicus* Brunner von Wattenwyl 1878 (Werner, 1901; Ramme, 1933; Karabag, 1958); Izmir: Brunner von Wattenwyl, 1891 (as *P. smyrnensis)* (Werner, 1901; Ramme,

Fig. 14. Large tubercle (probably gland) on the first abdominal tergit of male *P. ampliatus* (CH2442).

1933; Karabag, 1958); Menemen / Izmir: Ramme, 1933 (Bey-Bienko, 1954; Karabag, 1958), Tazegül & Önder, 1995; Karacabey / Bursa: Ramme, 1933 (Karabag, 1958) [Karachabey / Izmir: mentioned by Uvarov, 1930 (Karabag, 1958) is probably identical with the former locality because both refer to animals collected by Sureya in 1930]; Aydin: Werner, 1901 (Bey-Bienko, 1954; Karabag, 1958); Petrota / Izmir: Werner, 1901 (as *P. smyrnensis*) (Karabag, 1958); Ulu Dagh: Karabag, 1958; Savastepe / Balikesir: Karabag, 1964; Marmaris / Mugla: Karabag, 1964; Muradiye / Manisa: Karabag, 1964; Bergama / Izmir: Tazegül & Önder, 1995; Dikili / Izmir: Tazegül & Önder, 1995; Ödemis / Izmir: Tazegül & Önder, 1995, Önder et al., 1999.

The record of *P. amissus* in Gem ormani, Bingöl province (not included in map) by Karabag (1964) is far outside the range of the other localities and needs confirmation. It was not mentioned by Ciplak et al. (1993).

MORPHOLOGY. The species shows all characters of the *P. ampliatus*-group. The male specimens from Lesvos have cerci with a relatively large denticle at the outside of the tip of the cercus, but as shown by Ramme (1933: pl. 9, fig. 44a-g) this character is quite variable between and even within populations. The stridulatory file bears 79 teeth (CH2975).
SONG. The calling song consisted of long uninterrupted sequences of syllables (fig, 12) with duration of at least 6 s but often longer than 24 s. The syllable repetition rate was 4-7 Hz (19-23°C), distinctly lower than in the other species of this group. Each syllable contained 15-20 impulses.

DISTRIBUTION: Aegaean island of Lesvos and west part of Asia minor (fig. 13).

5) *Poecilimon intermedius* (Fieber, 1853)

(Fieber, 1853: 176, 260 (*Barbitistes intermedia*); locus typicus: Russia: southern Ural, Spasskoe (Spask) on the Bolshoi Ik River, east of Chkalov (Orenburg) (based on Bey-Bienko, 1954). Type material: lost (fide Otte 1997; but see below)

MATERIAL EXAMINED: *P. intermedius*: Russia: 2♀ ♀ (ZIN) (labelled: Karaganda region/Dolinskoje village/l/p. Karagaga/ 7.viii.1934//Churbay-Nura/inundated meadow/Kazansky A.N. (in Russian)//*Poec. intermedius* Fieb./E. Miram det)
P. fussi: Russia: 1♂ (ZIN) (labelled: *Poecilimon intermedius*/Fieb./Miram det.//Gremyachka/Ryazan region/Zukova, 25.vii.1911, Semenov (in Russian)// cf. *Poecilimon fussi*/det. Heller & Lehmann); Moldavia: 1♂ (ZIN) (considered as a male of *P. intermedius* in ZIN; labelled: Moldavia SSR/Kopaklia village/field in oak forest/Chetyrkina/21.vii.94 8 (in Russian)//n 98//1// cf. *Poecilimon fussi*/det. Heller & Lehmann); Ukraine: Kiev district, Kanev, Forest Reserve and surroundings, many specimens (18-23.June 1996, leg. K.-G. Heller)

The species was described according to one female (Fieber, 1853: 176), probably from Spask in Russia. Later, in a separate paper, the description of the male was added (Fieber, 1853: 260, locality unknown). This male seems to be lost. According to Bey-Bienko (1954) it may have represented another species, although it remains open which observation this remark is based on. Brunner von Wattenwyl (1888) made his description based on a female from Spask in his collection (from the collection of Fieber), which represents at least a topotype if it is not identical with the holotype. He explicitly mentioned that he has not seen another specimen.

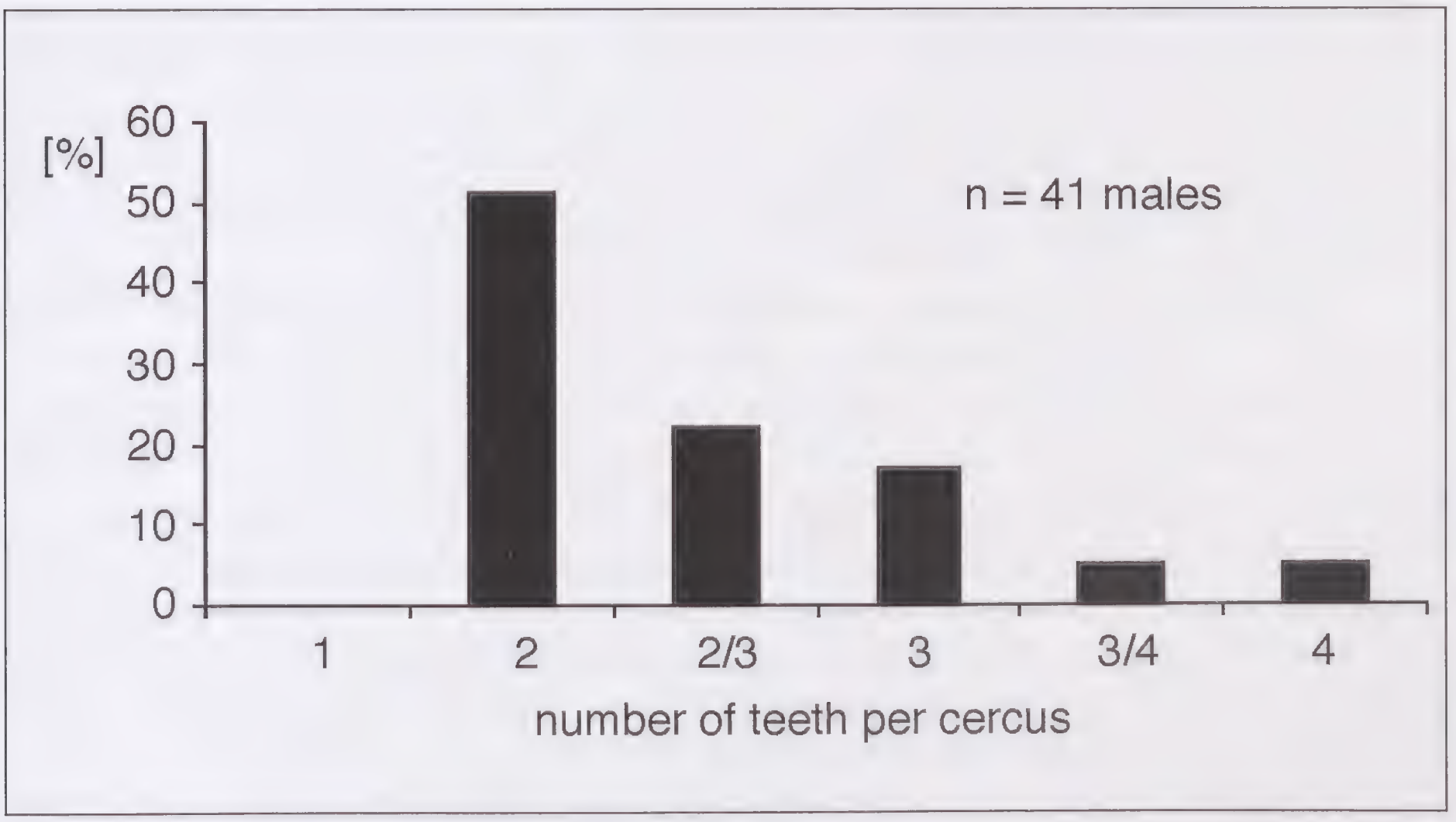


Fig. 15. Number of teeth/cercus in *Poecilimon ebneri* (2/3 and 3/4 indicate specimens with different numbers on left and right cercus), based on specimens in CL (n=41).

Later on, in many places females were collected, and the species propagates without any doubt parthenogenetically (see Bey-Bienko 1927, 1954). So it is not surprising that in most places despite intensive searching no males were found.

However, in addition to the description of Fieber, there exist some descriptions of males and some male specimens considered to be *P. intermedius*. After Fieber's male a second male was mentioned by Eversmann (1859), but it seems also to be lost. The first males which are still available were found in 1911 in Russia (see Material examined). One of them was used by Ramme (1933) in his revision of the genus *Poecilimon.* According to this animal *P. intermedius* was grouped in the *P. fussi*-group. Ramme even mentioned that if the female would not be so different from *P. fussi* it might be considered to be the same species. According to his paper, *P. intermedius* females, however, are similar to females of *P. ampliatus*.

Comparing morphological characters between this male and the females of *P. intermedius* there is little doubt that they belong to different species. The males have very large spiracles typically for males of the *P. fussi* group, whereas these structures are extremely small in the females. Although in some *Poecilimon* species a sexual dimorphism in spiracle size is obvious, differences of this magnitude were never observed (Stumpner & Heller 1992). The females of other members of the *P. fussi* group (*P. fussi*, *P. elegans, P. macedonicus, P. brunneri*) possess much larger spiracles than the *P. intermedius* females. In females of these species the elytra also overlap, and the animals are able to produce sound. In *P. intermedius*, however, the elytra are very small and not in contact to each other, similarly as found, for example, in *P. veluchianus* females and the other species of the *Poecilimon ampliatus* group. This difference between females of *P. intermedius* and the *P. fussi* related species was already illustrated by Kis (1957). So the males erroneously identified as *P. intermedius* males are either misidentifications of *P. fussi* or may represent another species of the *P. fussi*-group. In accordance with these results males described as *P. intermedius* were only found in the western part of its range where this species overlaps in its distribution with *P. fussi* and related species. To apply the name *P. intermedius*-group on forms from the affinity of *P. fussi* as did Maran (1952) is certainly not correct.

Ramme did not consider the possibility that males and females represent two different species, probably because he received the information that the male and one of the females he examined were captured *in copula*. However, even if this observation is correct it does not present unequivocal evidence that only one species is involved. We have seen several interspecific matings between different and not closely related *Poecilimon* species in captivity (e.g. between *P. werneri* and *P. veluchianus)* or even between genera (*P. ornatus* and *Isophya tosevski*). Because *Poecilimon intermedius* females react phonotactically to signals of other phaneropterid species (Zhantiev, personal communication), they may approach males of other species and mate, possibly to obtain the nutritious spermatophore (see Heller et al. 1998).

From these data we are convinced that in *P. intermedius* the same situation is found as in *Saga pedo*, where all described males have been shown to be misidentifications (Kaltenbach 1967).

DISTRIBUTION: Outside of Russia the species has been found at only few localities in a narrow band with approximately 100km north-south extension:

Czech Republic: Hustopece: Chladek 1980. Slovakia: Bíle Karpaty Mts.: Cejchan 1983a, 1983 b. Hungary: Aggtelek karst region: Nagy & Rácz 1996, Rácz 1998, Nagy et al. 1999; without locality: Frivaldsky 1867 (fide Maran 1952, Kis 1957); S.-A-Ujhely (=Satoraljaujhely): Chyzer 1897 (Maran 1952, Kis 1957). Rumania: Cluij: Kis 1957 (Kis 1962, Kis & Vasiliu 1970, Kis 1978). Whether the Hungarian records from the 19th century really represent *P. intermedius* or possibly *P. fussi* remains open

In Russia and more eastern situated states (Kasachstan), however, many localities are known (e.g. Bey-Bienko 1954, Warchalowska et al. 1996), and the range of the species reaches Eastern Siberia and central Tien-Schan (Bey-Bienko 1954).

DISCUSSION

Among the European *Poecilimon* species the 5 species treated above form a natural unit. It is difficult, however, to propose hypotheses about the relationships within this group and about their sister group or sister species. Most closely related are certainly *P. ampliatus* and *P. ebneri*, considered as members of one superspecies by Heller (1988). It will be interesting to study the contact zone between these two species which can morphologically easily differentiated by the large dorsal tubercle/gland in *P. ampliatus*. Solving the relationships to the other species, especially the two southern, has to wait until additional data become available. In the Turkish fauna there exist several species which seem to have similarities to the European members of the *ampliatus*-group, e.g. *adentatus* Ramme, 1933, *izmirensis* Ramme, 1933, *uvarovi* Ramme, 1933, *excisus* Karabag, 1950 and *haydari* Ramme, 1951. In contrast to the European members, some of these species have very elaborate cerci. They share, however, important morphological characteristics with the European species of the *P. ampliatus*-group (e.g. shape of pronotum) as well as the basic song pattern (unpublished data). After solving the phylogenetic pattern within this group it may be more substantiated to propose sister group relationships to other *Poecilimon* species than at the moment.

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On the identity of *Metaplastes ippolitoi* and the other species of the genus *Metaplastes* (Orthoptera Tettigoniidae)

Abstract - On the basis of morphological and bioacustic characteristics, the authors discuss the identity of *Metaplastes ippolitoi* La Greca, presenting the differences with *M. pulchripennis* (A. Costa) and reporting the first records of both species for Sicily (*M. ippolitoi* on Madonie Mts., *M. pulchripennis* on Nebrodi Mts.). The species of the genus *Metaplastes* Ramme, 1939, namely *M. ippolitoi* La Greca, 1948, *M. oertzeni* (Brunner von Wattenwyl, 1891), *M. ornatus* (Ramme, 1931) and *M. pulchripennis* (A. Costa, 1863), are critically reviewed. The males of these species may be easily distinguished by characteristics of the apex of the abdomen, while their bioacoustic behaviour supports their specific identity. The four species can be divided into two groups; the first (*ippolitoi-pulchripennis*) has a Tyrrhenian distribution, while the second one (*oertzeni-ornatus*) has a southern Balcanian distribution.

Riassunto - *Sull'identità di* Metaplastes ippolitoi *e sulle altre specie del genere* Metaplastes *(Orthoptera Tettigoniidae).*
Viene confermata l'identità di *Metaplastes ippolitoi* La Greca, sulla base sia delle caratteristiche morfologiche, esaminate su esemplari provenienti da diverse località, che della peculiare bioacustica. La specie viene confrontata con *M. pulchripennis* (A. Costa) ed entrambe vengono riportate per la prima volta in Sicilia (*M. ippolitoi* nelle Madonie e *M. pulchripennis* nei Nebrodi). Il genere *Metaplastes* Ramme, 1939 viene analizzato in tutte le sue specie finora note: *M. ippolitoi* La Greca, 1948, *M. oertzeni* (Brunner von Wattenwyl, 1891), *M. ornatus* (Ramme, 1931) e *M. pulchripennis* (A. Costa, 1863). Sulla base sia delle caratteristiche morfologiche, in particolare dell'apice dell'addome del maschio, che della bioacustica, queste quattro specie possono essere nettamente raggruppate in due gruppi distinti: uno tirrenico, *ippolitoi-pulchripennis* e l'altro balcanico-meridionale, *oertzeni-ornatus*. Anche l'analisi biogeografica conferma questo raggruppamento che potrebbe suggerire una separazione ad un livello tassonomico sovraspecifico. Viene discussa e raffigurata la distribuzione delle specie del genere.

Key words: *Metaplastes*, morphology, bioacoustics, biogeography.

INTRODUCTION

In 1998 M. La Greca suggested one of us (P.F.) to check the identity of the Italian endemic *Metaplastes ippolitoi* La Greca 1948, on the basis of the bioacoustic behaviour. Thanks to his information it was possible to find many specimens of this species in the type locality (Longobucco, Calabria, S-Italy). Moreover, in 2001 we also found the species in Sicily. This gave us the opportunity to evaluate the status of *M. ippolitoi*, and, on the basis of preliminary analysis of the bioacoustics, to compare it with *M. pulchripennis* (A. Costa, 1863).

METHODS

Songs of *Metaplastes pulchripennis* and *M. ippolitoi* were recorded between 1998 and 2001 in the laboratory. Males were recorded separately to restrict interactions. A DAT recorder (Sony TCD 100) with condenser microphone (Sennheiser K30AV module with ME80) was used and sampled fragments (44.1 kHz, 16 bits) from the recordings were analysed.

The song terminology follows RAGGE & REYNOLDS (1998): *Calling song* (the song produced by an isolated male); *Syllable* (the sound produced by one complete opening and closing movement of the fore wings); *Hemisyllable* (the sound produced by one unidirectional movement (opening or closing) of the fore wings); *Echeme* (a first-order assemblage of syllables).

ABBREVIATIONS: AC = A. Carapezza; BM = B. Massa; BW-NMW = Brunner v. W. collection, Naturhistorisches Museum Wien; CS-MZUR = Salfi collection, Museo Zoologico dell'Università di Roma; DK = D. Kofol; FDF = F. Di Franco; FMB = F. M. Buzzetti; FW = F. Willemse; GC = G. Costa; GO = G. Osella; LW = L. Willemse; MLG = M. La Greca; MO = M. Osella; PD = P. Dall'Ara; PF = P. Fontana; RK = R. Kleukers; SB = S. Biondi; VN = V. Nobile.

RESULTS

Metaplastes ippolitoi La Greca, 1948

Metaplastes ippolitoi, La Greca, 1948, Boll. Soc. Nat. Napoli, 10: 1.
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Metaplastes ippolitoi, Otte, 1997, Orthoptera species file, 7. Tettigonioidea: 120.
Metaplastes ippolitoi, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera. Vol. I. Tettigonioidea (CD ROM).

TYPE LOCALITY. ITALY, Calabria, La Sila, Monte Cozzo di Vitalba, Longobucco (province of Cosenza), about 1200 m.

EXAMINED MATERIAL. ITALY, Calabria, Cosenza province: La Sila Mts, Cozzo della Vitalba, Longobucco, 900 m, VII.1948, 1 ♂ (*holotype*), leg. MLG, coll. MLG; La Sila Mts, Longobucco, loc. Puntadura, 450 m, 23.VI.1999, 4 ♂♂, 3 ♀♀, on *Pistacia lentiscus*, leg. PF & FMB, coll. PF; La Sila Mts, Mt Botte Donato, loc. Mt Sorbello, 1730 m, 23.VI.1999, 1 ♂, on *Rubus* sp., leg. PF, coll. PF; La Sila Mts, Mt Botte Donato, 1850 m, 26.VIII.1991, 1 ♂, coll. MLG; Catanzaro province: Le Serre Mts, Mt Pecoraro, VI.1960, 1 ♂, leg. MLG, coll. PF; S. Cosmo Albanese, 600 m, 20.VI. 1995, 2 ♂♂, 1 ♀, coll. MLG; same locality, 2.VII.1995, 1 ♂, 4 ♀♀, coll. MLG; Sicily, Palermo province: Madonie Mts, Castelbuono, 9.VI.2001, leg. AC, 1 ♂ on *Quercus*, 1 ♀ on *Prunus*, coll. BM; Castelbuono, loc. Liccia, 813 m, 24.VI.2001, 4 ♂♂, 3 ♀♀ on *Teline monspessulanum*, leg. PF & BM, coll. PF; Madonie Mts, Polizzi Generosa, loc. Vallone S. Nicola, 800-1000 m, 18.VI.2001, 1 ♀, leg. SB, coll. PF.

DISTRIBUTION. *M. ippolitoi* is known only from a few localities in Southern Italy (Calabria) and Sicily (Madonie Mountains) (fig. 28).

BIOACOUSTICS. In all the recorded specimens we find a calling song consisting of a series of 3-5 echemes, repeated irregularly (fig. 27). The echemes within a series are repeated at the rate of about 0.5/s. The time between two series often exceeds several minutes. Echemes last for about 350-450 ms and consist of 9-13 syllables, with a syllable repetition rate of about 26-40/s. The final syllable of an echeme (or rarely two) follows about 100-180 ms after the preceding one. The first syllables of an echeme are somewhat weaker than the rest.

Metaplastes pulchripennis (A. Costa, 1863)

Odontura pulchripennis A. Costa, 1863, Nuovi studi entomologia Calabria Ulteriore: 25.
Barbitistes pulchripennis, Brunner von Wattenwyl, 1878, Monographie der Phaneropteriden: 58.
Barbitistes pulchripennis, Brunner von Wattenwyl, 1882 Prodromus Europaischen Orthopteren: 268, 272.
Metaplastes pulchripennis, Ramme, 1931, Beitrage zur Kenntnis der Palaearktischen Orthopterenfauna: 172.
Metaplastes pulchripennis, La Greca, 1948, Boll. Soc. Nat. Napoli, 10: 3.
Metaplastes pulchripennis, Chopard, 1951, Orthopteroides, Faune de France, 56 : 95.
Metaplastes pulchripennis, Bey Bienko, 1954, Orthoptera, fauna U.S.S.R., 2: 249.
Metaplastes pulchripennis, Baccetti, 1958, Mem. Soc. Entomol. Ital., 37: 107.
Metaplastes pulchripennis, Harz, 1969, Orth. Eur., 1: 82.
Metaplastes pulchripennis, Capra & Carli, 1969, Arch. Bot. Biogeogr. Ital. 45,14,4: 324.
Metaplastes pulchripennis, Heller, 1988, Bioakustik der europäischen Laubheuschrecken: 26.
Metaplastes pulchripennis, Failla et al., 1994, Checklist specie fauna italiana, 36: 7.
Metaplastes pulchripennis, Heller et al., 1998, Articulata, 7: 27.
Metaplastes pulchripennis, Otte, 1997, Orthoptera species file, 7. Tettigonioidea: 120.
Metaplastes pulchripennis, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera. Vol. I. Tettigonioidea (CD ROM).

TYPE LOCALITY. ITALY, Calabria region, hills around Palizzi (Reggio Calabria province).

EXAMINED MATERIAL. ITALY, Piemonte, Alessandria province, Voltaggio, 1878, 10 ♂♂, 8 ♀♀, BW-NMUW; Tuscany, Grosseto province: L'Uccellina Mts, loc. S. Rabano, 300 m, 10.VII.1978, 8 ♂♂, 4 ♀♀, leg. GO, 4 ♂♂, 2 ♀♀ coll. PF, 4 ♂♂, 2 ♀♀ coll. MLG; L'Uccellina Mts, loc. S. Collelungo, 10.VII.1978, 1 ♂, leg. GO, coll. P♀; Follonica, loc. Puntone di Scarlino Cà Violina, 30.VI.1999, 1 ♀, leg. PD, coll. PF; Latium, Rieti province, Sabini Mts, Poggio Catino, 400 m, VII.1962, leg. F. Tassi, coll. MLG; Latina province: Circeo Mt, loc. Piscina Bagnature, 18.VI.1977, 1 ♂, coll. PF; Campania, Ischia, 2 ♂♂, coll. CS-MZUR; Basilicata, Potenza province, Mt Pollino, Vallone Gaudolino, 950-1250, 25.VII.1950, 1 ♂, leg. MLG, coll. MLG; Calabria, Cosenza province: Orsomarso, Valle Fiume Argentino, 140 m, 24.VI.1982, 5 ♂♂, 2 ♀♀, on *Rubus* sp., leg. PF, coll. PF; Reggio Calabria province, Aspromonte, 4.VII.1910, 1♂, BW-NMUW; Sardinia, Sassari province, Olbia, Priatu (North of Mt Limbara), 1 ♀ on *Ilex aquifolium*, 6.VI.01 lg FMB, coll. FMB; Sicily, Messina province: Nebrodi Mts, Cesarò, P.lla Miraglia, 1500 m, 18.VII.1975, 1 ♂, leg. GC; coll. MLG; Nebrodi Mts, Floresta, Serra del Re, 1550 m, 20.IX.1991, 1 ♀, leg. FDF, coll. MLG; Nebrodi Mts, Contrada Crucitti, 24.VI.1987, 1 ♀, leg. VN, coll. MLG.

DISTRIBUTION. *M. pulchripennis* is the most widespread species of the genus. Bolivar (1900) reported *M. pulchripennis* from Spain, on the basis of a female collected at Monserrat (Barcelona). Harz (1969) and Gangwere & Morales Agacino (1970), too, report it for the Iberian fauna. Recently, Olmo i Vidal (2002) confirms its distribution in several localities in Catalonia, at altitudes between 184 and 1000 m. A record from western Bulgaria, on Rila Mountains (Frey Gessner, 1893), needs to be confirmed (Bey Bienko, 1954), but probably has been the result of a confusion with *M. ornatus* or *M. oertzeni* (Capra & Carli, 1969). Apart from Spain it is known from the Italian Apennines from Liguria to Calabria and Sicily (Nebrodi Mts), Tuscany Archipelago (Baccetti, 1958) and the Ischia isle. Furthermore, the distribution includes northern Sardinia (Mt Limbara) and Corsica (Ponte Leccia, Trinité de Porto Vecchio, Poggiala de Figari), where, according to Chopard (1951), it is not rare and can be found in June and July on *Cistus monspeliensis*) (fig. 28).

BIOACOUSTICS. The calling song of three recorded specimens consists of a fairly regularly repeated echeme, with a repetition rate of about 0.4/s (fig. 27). Echemes last for about 400-500 ms and consist of 10-17 syllables, with a syllable repetition rate of about 30-35/s. The final one or two syllables of an echeme follow about 140-150 ms after the preceding one. The first syllables of an echeme are clearly weaker than the rest.

Metaplastes oertzeni (Brunner von Wattenwyl, 1891)

Barbitistes oertzeni Brunner von Wattenwyl, 1891, Additamenta zur Monographie der Phaneropteriden: 31.
Metaplastes oertzeni, Ramme, 1931, Beitrage zur Kenntnis Palaearktischen Orthopterenfauna I: 172.
Metaplastes oertzeni, Bey Bienko, 1954, Orthoptera, fauna U.S.S.R., 2: 251.
Metaplastes oertzeni, Harz, 1969, Orth. Eur., 1: 78.
Metaplastes oertzeni, Willemse, 1977, Ent. Ber., Amsterdam, 37 (1): 106; syn. of *Metaplastes ornatus*.
Metaplastes oertzeni, Willemse, 1984, Fauna Greciae, 1: 31.
Metaplastes oertzeni, Willemse, 1985, Fauna Greciae, 1a: 10.
Metaplastes oertzeni, Heller, 1988, Bioakustik der europäischen Laubheuschrecken: 26.
Metaplastes oertzeni, Heller et al., 1998, Articulata, 7: 27.
Metaplastes oertzeni, Otte, 1997, Orthoptera species file, 7. Tettigonioidea: 120.
Metaplastes oertzeni, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera. Vol. I. Tettigonioidea (CD ROM).

TYPE LOCALITY. GREECE, Peloponnesus, Olympia.

EXAMINED MATERIAL. GREECE, Peloponnesse, Akhaia, Sella-Pititsa, NE slopes Mt Panakhaikon, 450-600 m, 08.VII.1991, 1 ♂, 1 ♀, leg. FW & LW, coll. PF; Olympia, 1M, 1F, BW-NMUW; M. Erimanthos, Kalentzi, 1200 m, 8.VI.2000, 1 ♂, 1 ♀, leg. GO, coll. PF; M. Erimanthos, Agios Triade, 7.VII.2000, 1 ♀, leg. GO, coll. PF; M. Panachaikon, dafnes Gregores, 29.VI.2000, 1 ♂, leg. GO, coll. PF.

DISTRIBUTION. *M. oertzeni* is known only from Peloponnesus in Greece (fig. 28).

BIOACOUSTICS. In *M. oertzeni* the calling song consists of a short series of about 3-4 echemes with 2-7 syllables. Syllables are repeated at the rate of about 6-7/s and are all of the same loudness (Heller, 1988). One single syllable follows after about 1 s. The next echeme follows within 200-400 ms after this syllable.

Metaplastes ornatus (Ramme, 1931)

Metaplastes ornatus Ramme, 1931, Beitrage zur Kenntnis Palaearktischen Orthopterenfauna I: 174.
Metaplastes pandaceos Werner, 1938, Ergbnisse der achten zoolg. Forschung. Griechland: 167.
Metaplastes ornatus, Ramme 1939, Beitrage zur Kenntnis der Palaearktischen Orthopterenfauna III: 50.
Metaplastes ornata, Bey Bienko, 1954, Orthoptera, fauna U.S.S.R., 2: 251.
Metaplastes ornata, Harz, 1969, Orth. Eur., 1: 79.
Metaplastes pandaceos, Harz, 1969, Orth. Eur., 1: 79.
Metaplastes ornatus, Willemse, 1977, Ent. Ber., Amsterdam, 37 (1): 106 (partim).
Metaplastes pandaceos, Willemse, 1977, Ent. Ber., Amsterdam, 37 (1): 106; syn. of *Metaplastes ornatus*.
Metaplastes ornatus, Willemse, 1984, Fauna Greciae, 1: 31.
Metaplastes ornatus, Willemse, 1985, Fauna Greciae, 1a: 10.
Metaplastes ornatus, Heller, 1988, Bioakustik der europäischen Laubheuschrecken: 25.
Metaplastes ornatus, Heller et al., 1998, Articulata, 7: 27.
Metaplastes ornatus, Otte, 1997, Orthoptera species file, 7. Tettigonioidea: 120.
Metaplastes ornatus, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera. Vol. I. Tettigonioidea (CD ROM).

TYPE LOCALITY. GREECE, Epiros, Ioannina.

EXAMINED MATERIAL. GREECE, Macedonia, Elati, Zagora, 900 m, 13.VII.2000, 2 ♂♂, 2 ♀♀, leg. PF & RK, coll. PF and BM; Thessaly, Metzovon, Kalambaka, 5.VI.1998, 1 ♂, 1 ♀, leg. AC, coll. PF; Metzovon, Kalambaka, on *Quercus frainetto*, 16.VI.1999, 3 ♂♂, 2 ♀♀, leg. GO, coll. PF; Ipiros, Konitza, Tymphi-Brakolimni, 2000 m, 3.VI.1982, 2 ♂♂, leg. GO & MO; coll. PF; Gliki, Acheron canyon, left slope, 200 m, VI.2000, 1 ♀, leg. DK, coll. PF; Platistoma, 1000 m, 20.VI.1999, 1 ♀, leg. GO, coll. PF; Ionian Islands, Levkas, Nidri, 1.VI.1932, 1 ♂, 1 ♀ (labelled as *Allotype* by W. Ramme), BW-NMUW; Belougiou, 1886, 1 ♂, leg. Kruper, BW-NMUW; Lefkas, Sivros, 4.VI.1999. 1 ♂, leg. GO, coll. PF.

DISTRIBUTION. *M. ornatus* occurs widespread in the Balkan peninsula and is presently known from Albania, Macedonia and northern and central Greece (fig. 28).

BIOACOUSTICS. The calling song of *M. ornatus* consists of short series of echemes. Echemes are more or less grouped in series of 3-4 and consist of 2-7 syllables. Syllables are repeated at the rate of about 6-8/s and are all of the same loudness (Heller, 1988). A faster repetition rate of echemes and longer series of echemes occurs in situations with social interaction.

DISCUSSION

MORPHOLOGY. Females of the genus *Metaplastes* apparently do not have specific morphological characters, but their generic status can be easily identified, mainly on the basis of the structures on the ventral side of the apex of the abdomen. By examining the apex of the abdomen of the male, the four species of the genus *Metaplastes* can easily be divided into two groups: *ippolitoi-pulchripennis* and *oertzeni-ornatus* (figs 11-14). Males of the first group, *ippolitoi-pulchripennis*, are characterised by a subgenital plate that has pointed lateral processes and a black apex, a single median process with a rounded apex with several teeth, by the cerci without a sub-apical inner expansion and by the last abdominal tergite that is not divided in the middle. Males of the second group, *oertzeni-ornatus*, are characterised by a subgenital plate that has rounded lateral processes with a uniform colour, two median processes with an acute, long and curved apex without teeth, by the cerci with a large sub-apical inner expansion and by the last abdominal tergite that is clearly divided in the middle.
M. ippolitoi can be easily distinguished from *M. pulchripennis* by the lateral process of male subgenital plate, which in all the examined specimens of the first species is thin, acute and long (figs 15-20). In *M. pulchripennis* this lateral process is stouter, short and only rarely acute (figs 21-25). *M. oertzeni* can be separated from *M. ornatus* by the blunty bipartite apex of cerci and by the sub-apical inner expansion of the cerci, acutely angulated in *M. oertzeni* and obtuse in *M. ornatus*.

IDENTIFICATION KEY TO THE MALES OF THE GENUS METAPLASTES RAMME, 1939

1 Subgenital plate with a median denticulated protuberance and two lateral spines; cerci without a marked subapical inner dilatation (figs 11-12) 2
- Subgenital plate without a median denticulated protuberance and only bearing two curved spines and two lateral smooth protuberances; cerci with a subapical inner dilatation (figs 13-14).....3
2 Subgenital plate lateral spines sharp (fig. 11) .....*M. pulchripennis*
- Subgenital plate lateral spines blunt (fig. 12) .....*M. ippolitoi*
3 Cerci with acute apex not directed backwards; inner dilatation obtuse (fig. 13).....*M. ornatus*
- Cerci with apex blunty bipartite and directed backwards; inner dilatation acute (fig. 14) .....*M. oertzeni*

BIOACOUSTICS. On the basis of our preliminary analyses, we conclude that there are some differences between *M. ippolitoi* and *M. pulchripennis*. *M. ippolitoi* in general has shorter echemes, with less syllables. Furthermore, *M. pulchripennis* shows a marked crescendo in the echemes that is correlated with the intensity of the wing movement (Heller, 1988). The echemes of *M. ippolitoi* in our recordings always occur in series of 3-5 echemes, whereas *M. pulchripennis* seems to sing continuously. This is in contrast with the description of the song of the latter species by Heller (1988), who states that a continuous song in *M. pulchripennis* only is heard in a situation of social interaction with other singing

males. He describes the undisturbed calling song of this species as consisting of repeated series of several echemes, as we find in *M. ippolitoi*. In our recordings specimens might have reacted to the song of conspecific individuals present in the same room, at a distance of several meters. Further research has to elucidate the influence of social interaction on the song pattern.
In conclusion, the song of *M. ippolitoi* is related to the song of the other species of the genus, but has its own characters. Considering syllable repetition rate and the structure of the echeme, the species is more closely related to *M. pulchripennis* than to *M. ornatus* and *M. oertzeni*.

BIOGEOGRAPHICAL ASPECTS. The morphological affinity of the central Mediterranean genus *Metaplastes* with the genus *Barbitistes*, consisting mainly of eastern species, suggests an eastern Mediterranean origin for *Metaplastes* as well. La Greca (1996) considers the genus *Metaplastes* as Apenninic-Balkanic and proposes a pleistocenic origin for the two Italian species, *M. pulchripennis* and *M. ippolitoi*. The high differentiation between the two species pairs *ippolitoi-pulchripennis* and *oertzeni-ornatus* suggests that their separation is old, maybe even dating back to the Miocene, during Mediterranean desiccation, when many eastern species were favoured to spread westwards. Supposedly, in this period *M. pulchripennis* was able to distribute from the Apennines to Catalonia. Probably during the penultimate glacial period, it was able to colonise Sardinia, Corsica, Sicily and other Tyrrhenian islands. *M. ippolitoi* very probably differentiated from *M. pulchripennis* during the last glacial period.

ECOLOGY. All the species of the genus *Metaplastes* live on bushes and small trees, in particular in ecotone habitat. *M. pulchripennis* lives mostly on *Rubus* spp., *M. ippolitoi* in its type locality (Longobucco) is quite commn on *Pistacia lentiscus* and in other localities on *Rubus* spp. too. In Sicily the same species has been found on small *Rubus* sp. bushes in a *Quercus ilex* wood. The Greek species of *Metaplastes* are frequent on *Quercus* sp.

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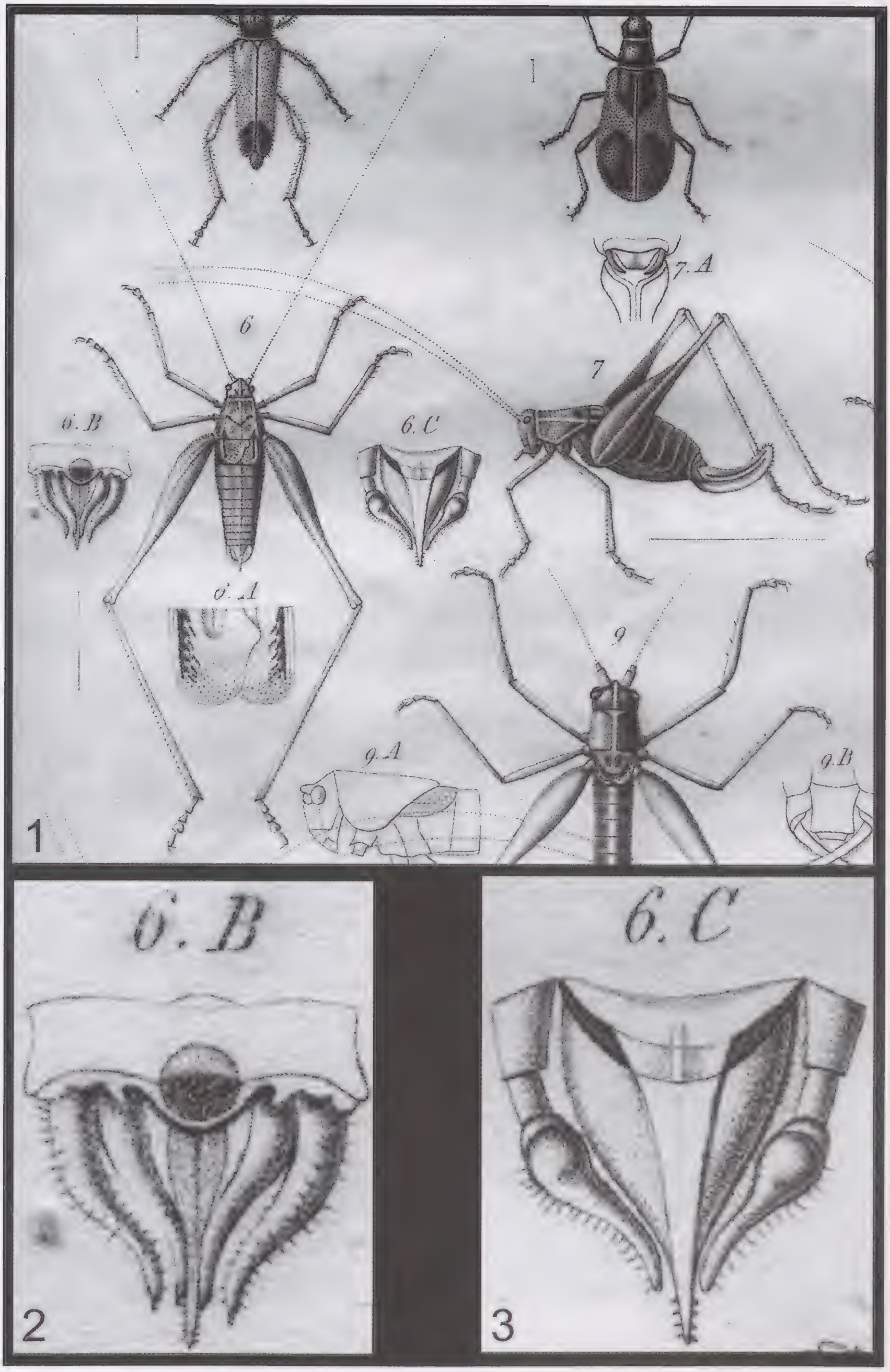


Figs 1-3. *Metaplastes pulchripennis*: particulars from table (Table I) from original description by A. Costa (1863).

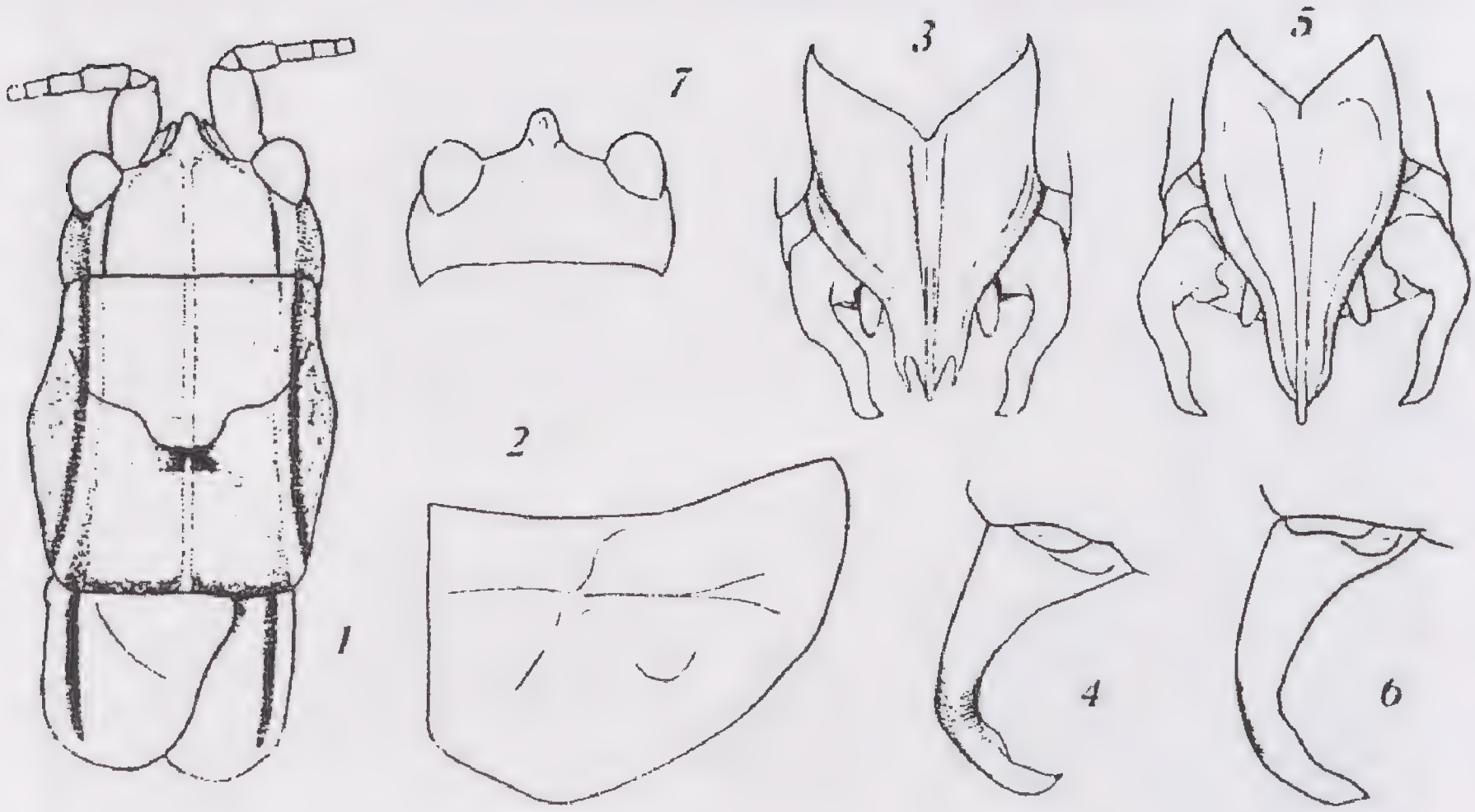
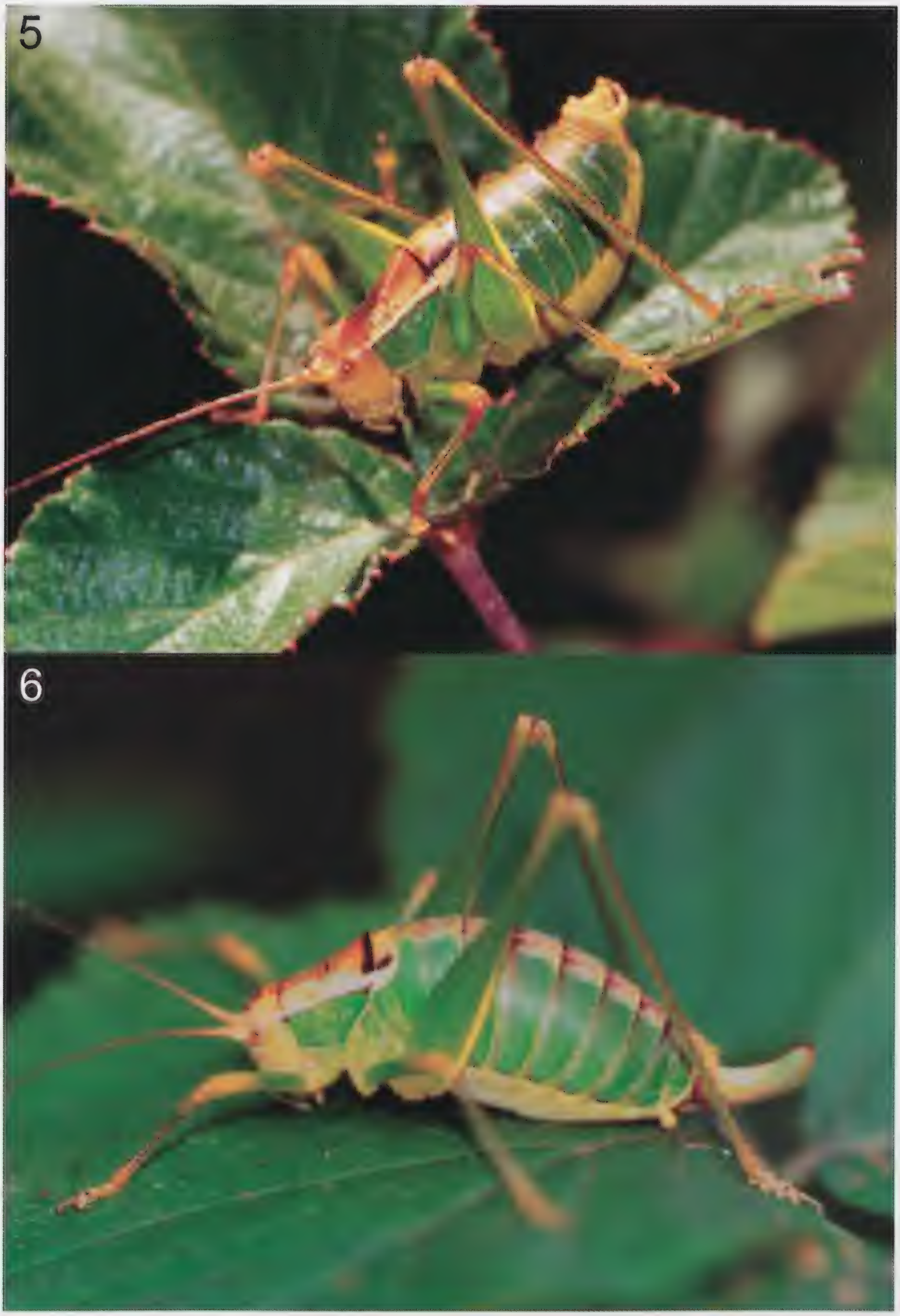
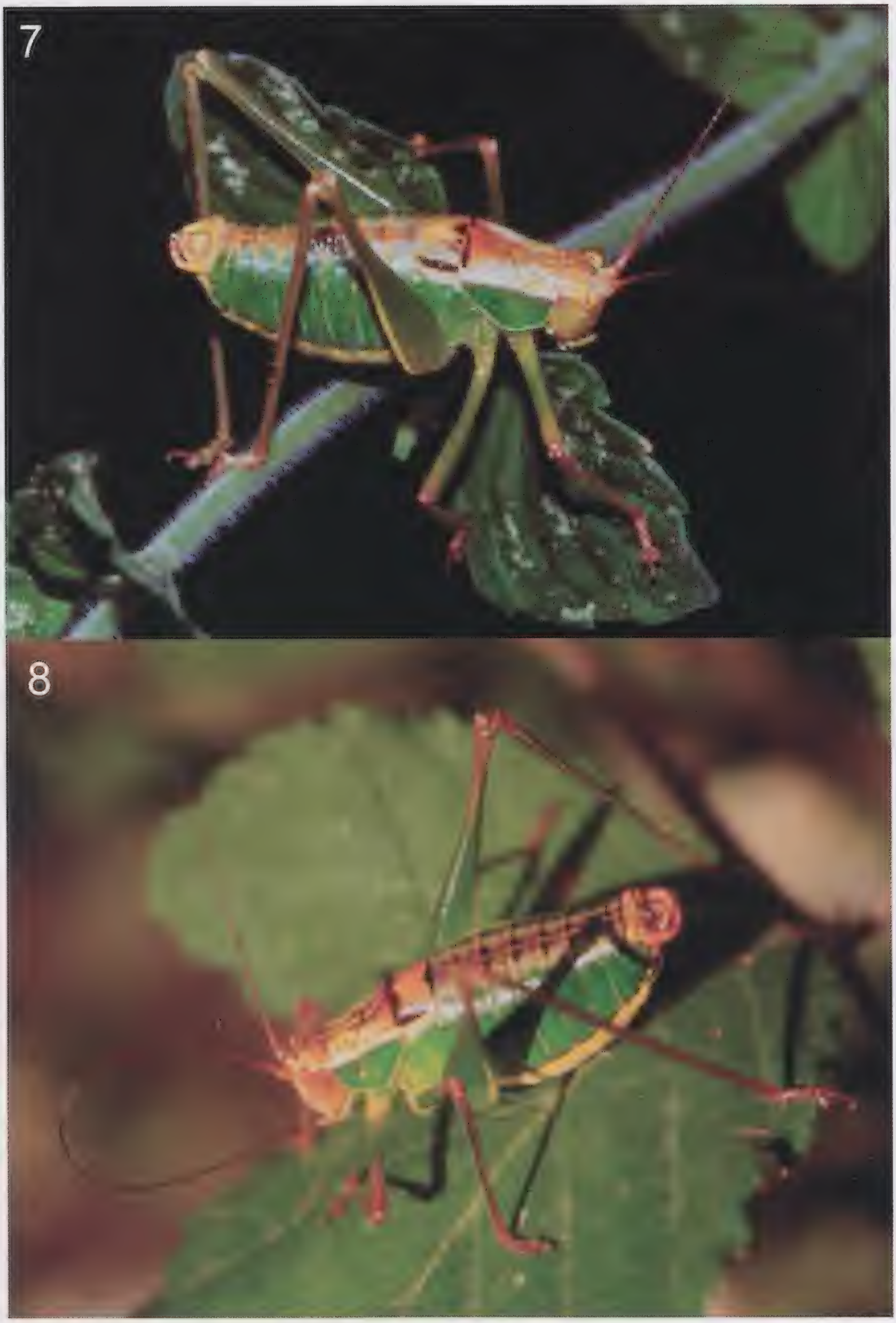


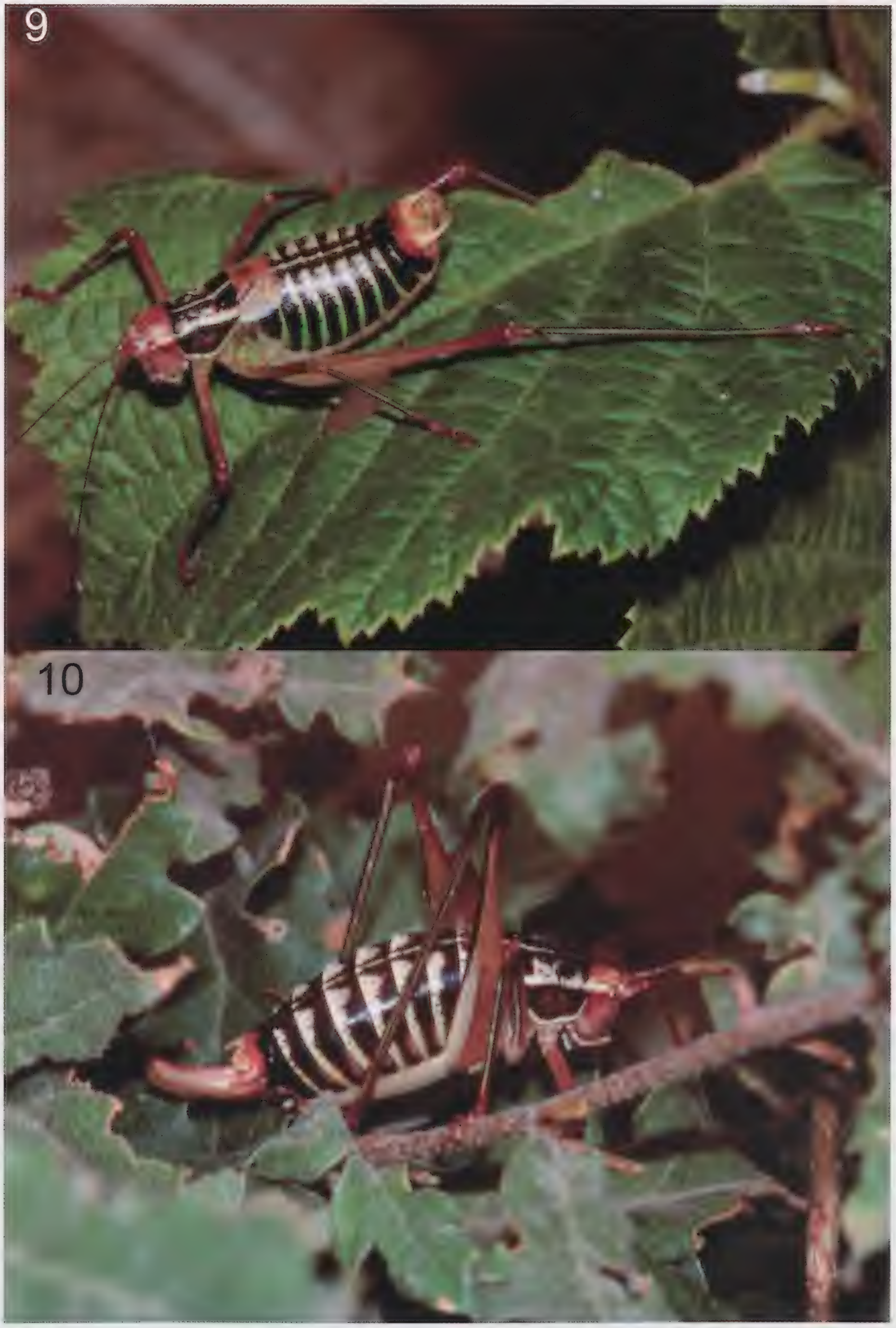
Fig. 4. *Metaplastes ippolitoi* and *M. pulchripennis*: table from the original description of *M. ippolitoi* by La Greca (1948). Figs 1-4 of the original table: *M. ippolitoi*; figs 5-7 of the original table: *M. pulchripennis*.



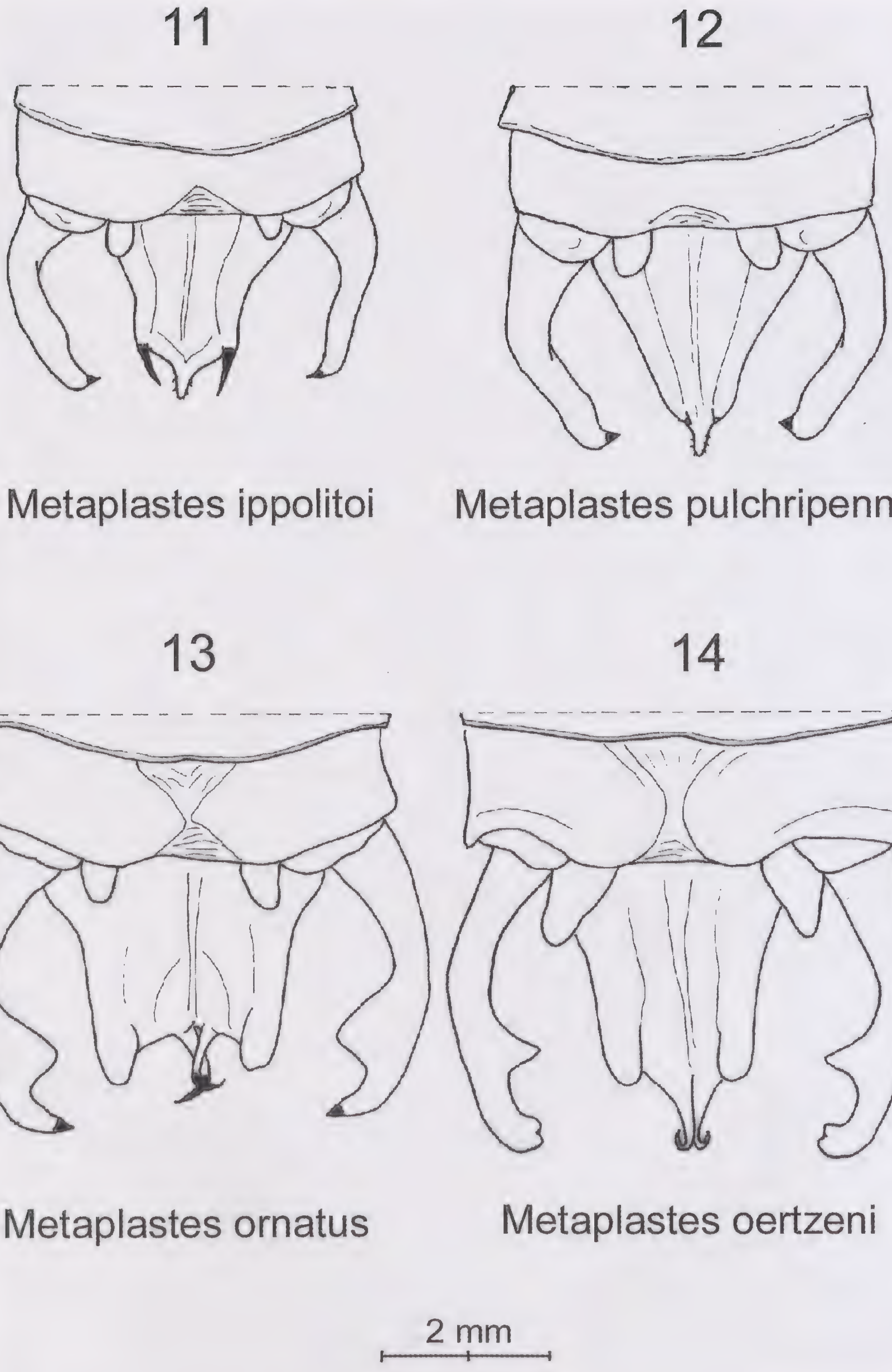
Figs 5-6. Habitus of *Metaplastes ippolitoi* from Longobucco (type locality): 5 - male; 6 - female. Photos P. Fontana.



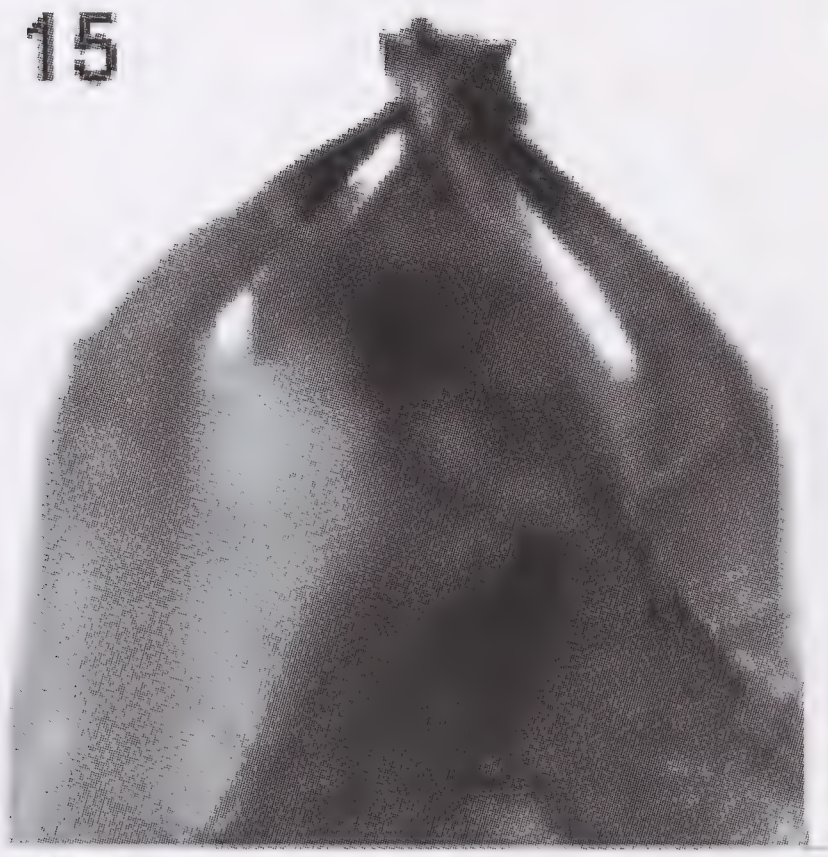
Figs 7-8. Habitus of *M. ippolitoi* and *M. pulchripennis*: 7 - *M. ippolitoi* male from Sicily, Madonie; 8 - *M. pulchripennis* male from Orsomarso (Calabria). Photos P. Fontana.

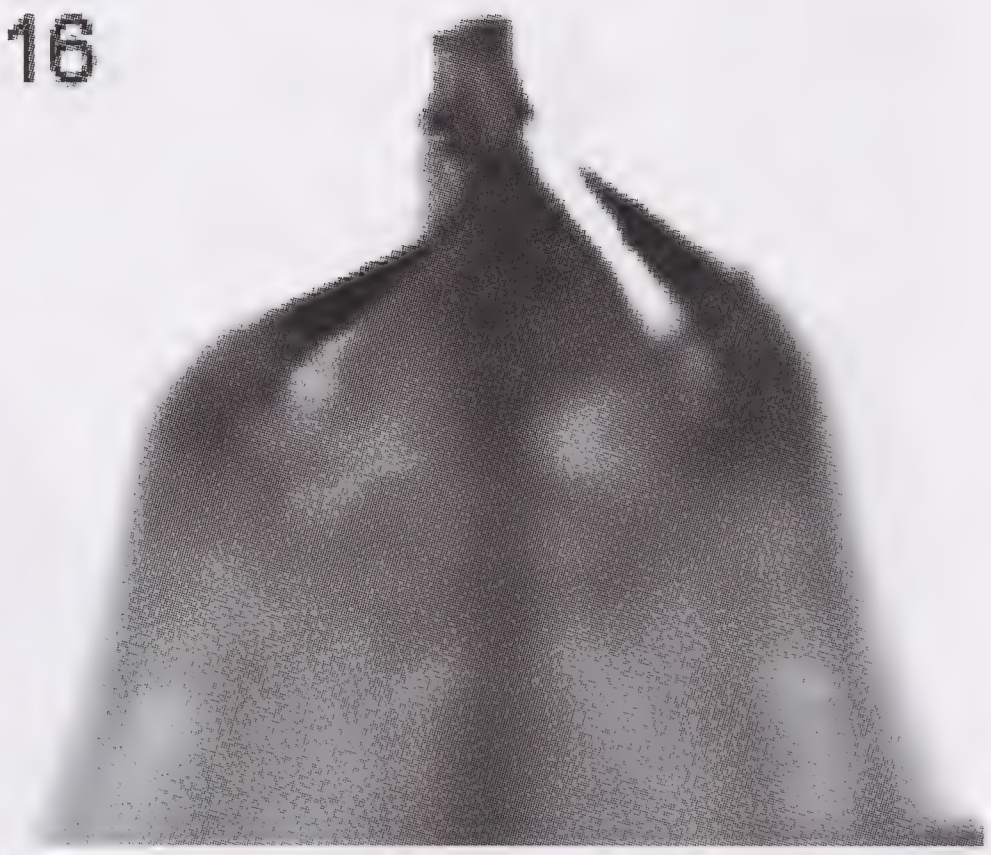


Figs 9-10. Habitus of *M. ornatus*: 9 - male from Elati, Zagora (Greece); 10 - female from Konitza (Greece, Aristi). Photos P. Fontana.

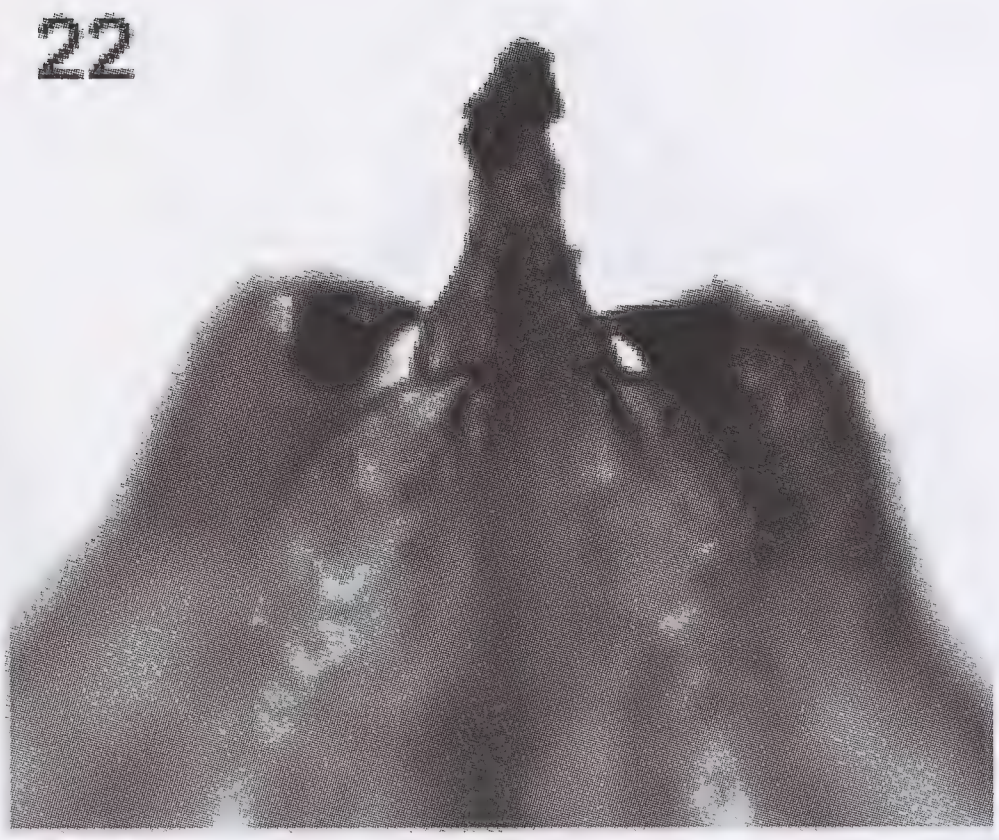


Figs 11-14. Dorsal view of the male abdomen apex of the species of the genus *Metaplastes*: 11 - *M. ippolitoi* from Mt Pecoraro (Calabria); 12 - *M. pulchripennis* from Torre Collelungo (Tuscany, Grosseto province); 13 - *M. ornatus* from Kalampaka (Greece); 14 - *M. oertzeni* from Sella-Pititsa (Greece, Akhaia). Original drawings by Paola Tirello.





Figs 15-20. Dorsal view of the male subgenital plate apex of *M. ippolitoi* from Italy: 15-16 - Calabria, Longobucco; 17 - La Sila, Mt Botte Donato; 18 - Mt Pecoraro; 19-20 - Sicily, Madonie Mts, Castelbuono. Photos P. Fontana.



Figs 21-26. Dorsal view of the male subgenital plate apex of *M. pulchripennis*: 21-22 - Calabria, Orsomarso; 23-24 - Tuscany, Uccellina; 25 - Latium, Mt Circeo; 26 - Sicily, Nebrodi Mts. Photos P. Fontana.

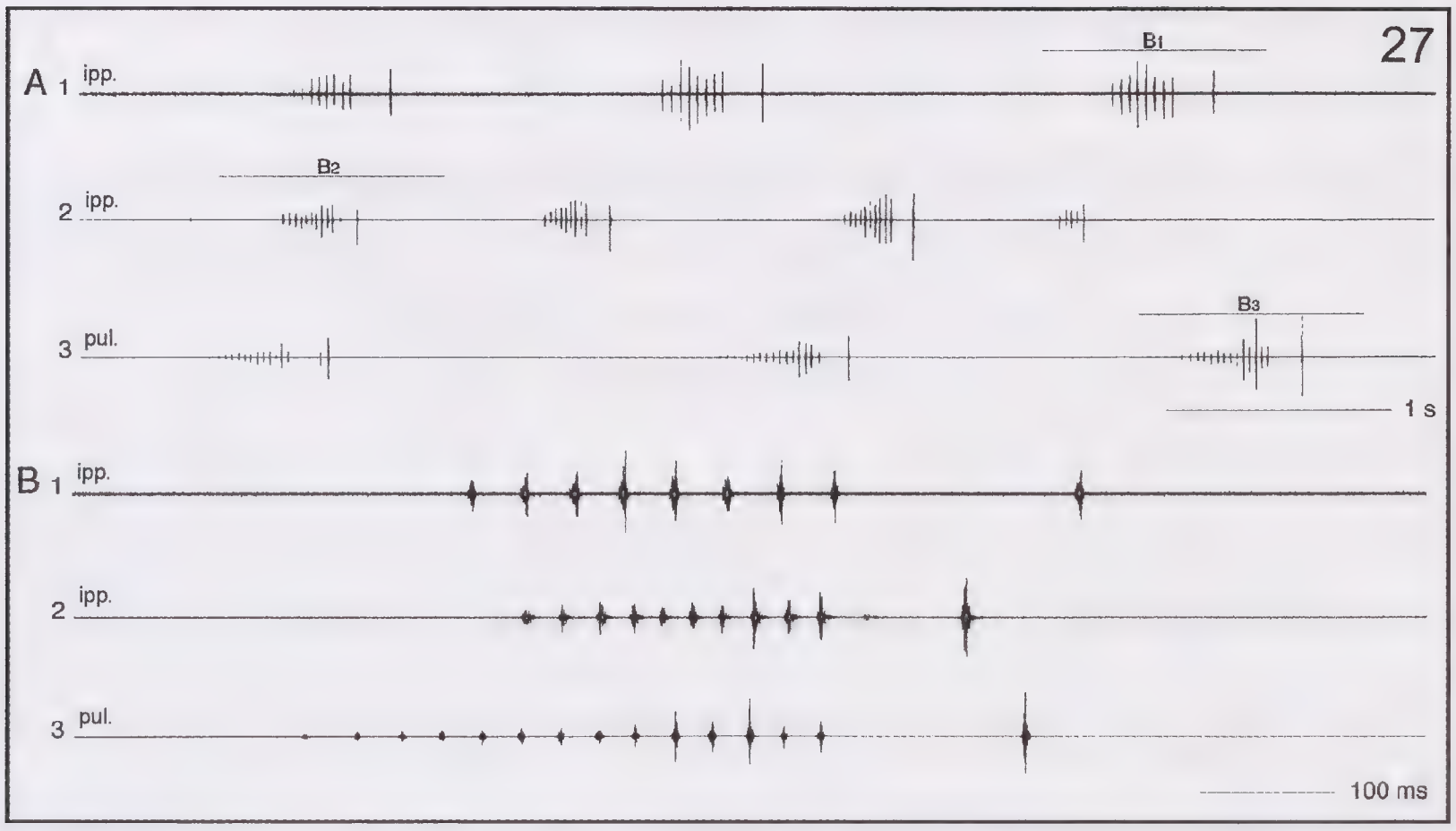


Fig. 27 (A_{1-3}-B_{1-3}). Oscillograms (A: overview and B: detail) of the calling song of *M. ippolitoi* and *M. pulchripennis*. *M. ippolitoi* (A_1, B_1) from Calabria region, Longobucco (Type locality); recording number PF1999-2B:2 (temperature 26°C), recorded by P. Fontana. *M. ippolitoi* (A_2, B_2) from Sicily, Madonie, Castelbuono; recording number PF2001D1:13 (temperature about 25°C), recorded by P. Fontana. *M. pulchripennis* (A_3, B_3) from Calabria region, Orsomarso; recording number PF1998-1B:7 (temperature 27,5°C), recorded by P. Fontana. Oscillograms by B. Odé.

Fig. 28. General distribution of *M. ippolitoi* (8-9), *M. oertzeni* (11), *M. ornatus* (10) and *M. pulchripennis* (1-7). **1**: Spain, Catalunya; **2**: France, Corse; **3**: Italy, Gorgona Island; **4**: Italy, Apennine; **5**: Italy, Sardinia, Mt Limbara; **6**: Italy, Ischia; **7**: Italy, Sicily, Nebrodi Mts; **8**: Italy, Calabrian Apennines; **9**: Italy, Sicily, Madonie Mts; **10**: Albania, Macedonia, northern and central Greece; **11**: Greece, Peloponnesus. The question mark refers to the doubtful record from western Bulgaria on Rila Mountains (Frey Gessner, 1893).

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Biogeographical considerations on some Mediterranean Phaneropteridae and description of a new genus and a new species from South Africa (Orthoptera)

Abstract - The specific and generic identity of some Phaneropteridae are discussed. In particular the name *Barbitistes obtusus* Targioni Tozzetti, 1881 is assigned exclusively to the Sardinian original citation, while the Alpine and Apennine records have to be referred to *Barbitistes alpinus* Fruhstorfer, 1921 **stat. nov.** *Isophya modestior* Brunner, 1882 is confirmed as monotypic species and *Isophya pyrenaea* (Serville, 1839) is omitted from Italian fauna. The identity of the Sicilian (topotypical) and Greek populations of *Poecilimon laevissimus* (Fisher, 1854) is confirmed, even on the basis of bioacoustics. The incomplete specimen preserved in the NHM of Leiden, is definitively identified as *Poecilimon varicornis* (De Haan, 1842), not as typus of *Locusta (Ephippigera) trilineata* De Haan, 1842, species now assigned to the genus *Odontura* Rambur, 1839 and named *Odontura trilineata* (De Haan, 1842) **n. comb.** *Poecilimon syriacus* Brunner, 1891 is recorded for the first time from Jordan. *Austrodontura* **n. gen.** is described to include *Austrodontura raggei* **n. sp.**, known for a single male collected in South Africa, similar (but not conspecific) to the holotypus female of *Odontura capensis* Walker, 1869, now also assigned to the new genus and named *Austrodontura capensis* (Walker, 1869) **n. comb.** *Odontura transfuga* Brunner von Wattenwyl, 1878 is transferred to the North and South American genus *Dichopetala* Brunner von Wattenwyl, 1878 and named *Dichopetala transfuga* (Brunner von Wattenwyl, 1878) **n. comb.** As consequence of these new combinations, the distribution of the genus *Odontura* is limited to the western Mediterranean region, and the genus *Barbitistes* Charpentier, 1825 covers only southern and central Europe.

Riassunto - *Considerazioni biogeografiche su alcune Phaneropteridae mediterranee e descrizione di un nuovo genere e una nuova specie del Sud Africa (Orthoptera).*
Sono discusse l'identità generica e specifica di alcuni Phaneropteridae. In particolare il nome *Barbitistes obtusus* Targioni Tozzetti, 1881 è assegnato esclusivamente alla citazione della Sardegna, mentre le popolazioni alpine ed appenniniche sono attribuite a *Barbitistes alpinus* Fruhstorfer, 1921 **stat. nov.** *Isophya modestior* Brunner, 1882 è confermata specie monotipica mentre *Isophya pyrenaea* (Serville, 1839) viene esclusa dalla fauna italiana. L'identità tra le popolazioni siciliane (topotipiche) e greche di *Poecilimon laevissimus* (Fisher, 1854) è confermata, anche sulla base della loro bioacustica. L'esemplare incompleto conservato presso il Museo di Leiden viene definitivamente identificato come *Poecilimon varicornis* (De Haan, 1842) e non come il typus di *Locusta (Ephippigera) trilineata* De Haan, 1842. Questa ultima specie è assegnata al genere *Odontura* Rambur, 1839 e dunque denominata *Odontura trilineata* (De Haan, 1842) **n. comb.** *Poecilimon syriacus* Brunner, 1891 viene segnalato per la prima volta di Giordania. Viene istituito *Austrodontura* **n. gen.** e vi viene inclusa *Austrodontura raggei* **n. sp.**, descritta su di un unico maschio raccolto in Sud Africa e alquanto affine, ma non conspecifico, con l'holotypus femmina di *Odontura capensis* Walker, 1869, ora attribuita al nuovo genere con il nome di *Austrodontura capensis* (Walker, 1869) **n. comb.** *Odontura transfuga* Brunner von Wattenwyl, 1878 viene trasferita al genere nord e sud-americano *Dichopetala* Brunner von Wattenwyl, 1878 e denominata *Dichopetala transfuga* (Brunner von Wattenwyl, 1878) **n. comb.** In conseguenza dell'istituzione del genere *Austrodontura* e della nuova posizione sistematica di *Dichopetala transfuga* (Brunner von Wattenwyl, 1878), il genere *Odontura* Rambur, 1839 appare limitato alla regione Mediterranea occidentale. In seguito alla nuova soluzione

nomenclaturale di *Odontura trilineata* (De Haan, 1842), il genere *Barbitistes* Charpentier, 1825 risulta presente solo in centro e sud Europa.

Key words: Biogeography, *Barbitistes alpinus* Fruhstorfer, 1921 n. comb., *Austrodontura* n. gen., *Austrodontura raggei* n. sp., *Austrodontura capensis* (Walzer, 1869) n. comb., *Odontura trilineata* (De Haan, 1842) n. comb., *Dichopetala transfuga* (Brunner von Wattenwyl, 1878) n. comb.

INTRODUCTION

We found some biogeographical and nomenclatorial problems related to some Phaneropteridae genera *Isophya* Brunner, 1878, *Barbitistes* Charpentier, 1825, *Poecilimon* Fisher, 1854 and *Odontura* Rambur, 1839, that we report in this paper, proposing new generic combinations. We follow Heller et al. (1998), who consider Phaneropteridae a distinct family, not a subfamily of Tettigoniidae.

RESULTS AND DISCUSSION

Genus *Isophya* Brunner, 1878

The genus *Isophya* Brunner von Wattenwyl, 1878 is placed by Otte (1997) in the tribe Barbitistini and numbers 83 taxa, mostly distributed in Caucasus, Asia Minor and Balkan countries (fig. 44). Systematic of this genus is very complex and morphological characters used to identify the different species are generally the shape of male cerci, pronotum and tegmina and female ovipositor. Bioacoustics are not well known and song was described only for few species (Heller, 1988; Fontana et al., 2002). Type species of the genus is *I. pyrenea* (Serville, 1839) originally described as *Barbitistes pyrenea*.

Isophya modestior Brunner, 1882

Isophya modestior Brunner, 1882, Prodr. Eur. Orth.: 276.
Isophya fusconotata Brunner, 1882, Prodr. Eur. Orth.: 276.
Isophya pyrenaea, Cobelli, 1905, Verh. K. k. zool. Bot. Ges., Wien: 368. (misidentification)
Isophya pyrenaea, Galvagni, 1950, Boll. Soc. entomol. ital., 80 (7-8): 57. (misidentification)
Isophya modestior modestior, Harz, 1976, Die Orthopteren Europas, I: 52.
Isophya modestior, Heller, Oekol. Forsch. Anwend, 1: 35.
Isophya modestior, Ingrisch, 1991, Mitt. Schw. Ent. Ges., 64: 276.
Isophya modestior, Failla et al., 1994, Checklist specie fauna d'Italia, 36: 7.
Isophya modestior, Heller et al., 1998, Checklist Eur. Orth.: 27.
Isophya modestior, Fontana, 1998, Boll. Mus. civ. St. Nat. Verona, 22: 12.
Isophya modestior, Fontana, 1999, Natura Vicentina, 3: 13.
Isophya modestior, Otte, 1997, Orthoptera Species File, 7: 117.
Isophya pyrenaea, Failla et al., 1994, Checklist specie fauna d'Italia, 36: 7.

Isophya modestior, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).
Isophya modestior modestior, Fontana et al., 2002, Cavallette, Grilli, Mantidi e Insetti affini del Veneto: 284.
Isophya modestior, Otte et al., OSF on line (version 2.1).

TYPE LOCALITY. Serbia, between Nish and Bela Palanca.

TYPE DEPOSITORY. Naturhistorisches Museum Wien.

EXAMINED MATERIAL: Italy, Veneto region, Vicenza province, Monte Summano, 1100 m, 06.IX.1998, 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Monte Grappa, M. Colombera- Borso, Borso del Grappa, 1450 m, 28.VII.1996, 2 ♂♂ and 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Monte Grappa, Pove del Grappa, 400 m, 04.VIII.1995, 1 ♂, leg. P. F., coll. P. F.; Vicenza province, Monte Grappa, Valle S. Felicita, Semonzo, 800 m, 28.VII.1996, 2 ♀♀, leg. P. F., coll. P. F.; Vicenza province, Colli Berici, Barbarano Vicentino, 05.VII.1999, 1 ♂, leg. A. Cogo, coll. P. F.; Vicenza province, Monte Summano, 800 m, 02.VIII.1994,1 ♀, Fontana P, Fontana leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Valgrande, 400 m, 22.VII.1995, 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Anzolone, 650 m, 25.VII.1997, 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Bosco di Tretto, 800 m, 13.VII.1995, 6 ♂♂ and 2 ♀♀, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Carpane, 750 m, 27.VII.1996, 4 ♀♀, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Santorso, 1100 m, 14.VIII.1992, 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Spiadi, 700 m, 09.VII.1998, 1 ♂, leg. P. F., coll. P. F.; Vicenza province, Monte Summano, Tretti loc. S. Rocco, 800 m, 17.VIII.1992, 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Vicenza, Monte Summano, 1100 m, 17.VIII.1992, 1 ♂, leg. P. F., coll. P. F.; Padova province, Colli Euganei, M. Calbarina, Arquà Petrarca, 20.V.1997, 1 ♂ nymph, leg. D. Zanaica, coll. P. F.; Padova province, Colli Euganei, M. Rusta, Cinto Euganeo, 21.V.1997, 1 ♀, leg. D. Zanaica, coll. P. F.; Verona province, Pente di Veja, 620 m, 30.VI.2001, 1 ♀, leg F. M. B. & A. Cogo, coll. F. M. B.; Verona province, Monte Pastello, Nogarole, 850 m, 28.VII.2001, 1 ♀, leg. F. M. B., Coll. F. M. B.

DISTRIBUTION: From the Balkans to the South East Alps.

Harz (1969) considers *Isophya modestior* as a polytipic species with two subspecies: *I. m. modestior* Brunner, 1882 and *I. modestior stysi* Cejchan, 1957. Although the Italian populations (fig. 1) were erroneously mentioned by Fontana et al. (2002) as *I. modestior modestior*, we agree with Heller (1988) who showed the specific level differences of the two taxa on the basis of bioacoustics and separated *I. modestior* Brunner, 1882 and *I. stysi* Cejchan, 1957.

Isophya pyrenaea (Serville, 1839)

Barbitistes pyrenaea Serville, 1839, Histoire naturelle des insectes Orthoptères : 481.
Barbitistes pyrenaea, Fieber, 1854, Lotos, 3: 185.
Barbitistes pyrenaea, Jacobson & Bianchi, 1902 [1902-1905], Orthopt. Pseudon. Insects Russian Empi.: 334, 366.
Isophya pyrenaea, Kirby, 1906, Synonimic Catalogue of Orthoptera, 2 (1): 384.
Isophya pyrenaea, Ramme, 1951, Mitt. Zool. Mus. Berlin, 27: 149.
Isophya pyrenaea, Chopard, 1951, Faune de France, 56: 90.

Isophya pyrenaea, Bey Bienko, 1954, Fauna of the USSR, 2 (2): 200.
Isophya pyrenaea, Harz, 1969, Die Orthopteren Europas, 1: 40.
Isophya pyrenaea, Heller, 1988, Oekol. Forsch. Anwend, 1: 35.
Isophya pyrenaea pyrenaea, Otte, 1997, Orthoptera Species File, 7: 117.
Isophya pyrenaea pyrenaea, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).
Isophya pyrenea, Otte et al., OSF on line (version 2.1).

TYPE LOCALITY. France: Pyrénées.

TYPE DEPOSITORY. Type lost.

DISTRIBUTION: Western Ukraine, Southern Poland, Southern and Central Germany, Czech Republic, Slovak Republic, Romania, Hungary, Austria, Switzerland and Central France to the Pyrenees.

Isophya pyrenaea (Serville, 1839) has been originally recorded in Italy by Cobelli (1905), later by Galvagni (1950) and more recently mentioned by Failla et al. (1994). All the citations of this species for the Italian fauna have to be referred to *Isophya modestior* Brunner, 1882, as stated by Ingrish (1991) and Fontana (1998).

Genus *Barbitistes* Charpentier, 1825

The genus *Barbitistes* Charpentier, 1825 is placed by Otte (1997) in the tribe Barbitistini and numbers only 14 taxa, mostly represented in Southern Europe (fig. 44). Type species of the genus is *B. serricauda* (Fabricius, 1794). Current status of the genus is very different, because some species were synonymised, while others have to be placed in different genera, as we will discuss here. In the past, most of the brachypterous Phaneropterinae were described under the genus *Barbitistes*, causing some identification problems of species. This is mostly based on morphological characters of the male abdomen apex (Harz, 1969; Galvagni & Fontana, 1999); also bioacoustics are very important (Heller, 1988; Ragge & Raynolds, 1998; Galvagni & Fontana, 1999; Fontana et al., 2002).

Barbitistes obtusus Targioni Tozzetti, 1881

Barbitistes obtusus Targioni Tozzetti, 1881, Boll. Soc. ent. ital., 13: 183.
Barbitistes obtusus, Brunner, 1882, Prodr. Orth. Eur.: 269. (partim)
Barbitistes obtusus, Harz, 1976, Die Orthopteren Europas, 1: 72. (partim)
Barbitistes obtusus, Failla et al., 1994, Checklist specie fauna d'Italia, 36: 7. (partim)
Barbitistes obtusus alpina, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).

TYPE LOCALITY: Sardinia, Cagliari.

TYPE DEPOSITORY: Type lost.

ORIGINAL DESCRIPTION BY TARGIONI TOZZETTI, 1881 (translated from Latin: see fig. 47):

Very greenish, antennae and upper part of the occiput ochra - postocular stripes shaded off and

carinae of the pronotum sulfur.

Pronotum short, straight, narrow, slightly depressed in the upper middle part, lateral lobes trapezoidal, hind margin oblique and longer (than the fore margin).

Elytrae basally free, slightly longer than pronotum, the left one overlapping (the right one), apically rounded, right margin basally cut, (elytra) slightly split in two lobes.

Male supra-anal plate basally widened, elliptically rounded. Cerci slender, very long and crossed. Subgenital plate very wide and shell-like, with a median carina on the basis, hindly flattened, with a narrow and deep impression in the middle, crosswise truncated lobes, contacting in the inner margin.

Species from Sardinia - neighbourhood of Cagliari, female lacking. Though very similar to *B. serricauda*, the sub-genital plate is wider, pronotum is shorter and colours are different; it also differs from *B. serricauda* var. B. v. W. for the hind margin of the subgenital plate flattened and not wavy, for the longer cerci and for the typical locality (Sardinia and not Switzerland or Tyrol).

DISTRIBUTION. Sardinia.

Targioni Tozzetti (1881), described *Barbitistes obtusus* on a male specimen collected in Sardinia. The original description is quite detailed, even if lacking of illustrations. The specific name "*obtusus*" was suggested to Targioni Tozzetti by the shape of the subgenital plate; cerci crossed (*decussati*) could be another character consenting its identification. Brunner (1882) referred some alpine populations of *Barbitistes* to the species of Targioni Tozzetti, pointing out that *B. obtusus* differs from *B. serricauda* (Fabricius, 1798) for the apex of male cerci obtuse (cercis ♂ apice obtusis).

Considering that during the XIX century most of the Phaneropteridae were described under the genus *Barbitistes* Charpentier, 1825, that male dried specimens of other genera of short winged Phaneropteridae may sometimes show their cerci crossed, that Brunner (1882) based key to species on one character not mentioned by Targioni Tozzetti (1881), and that any species belonging to the genus *Barbitistes* was never collected in Sardinia, after the description of *B. obtusus* (we point out that micropterous Phaneropteridae of the genera *Odontura* Rambur, 1839, *Metaplastes* Ramme, 1939 and *Leptophyes* Fieber, 1853 are recorded from Sardinia), we propose that the name *Barbitistes obtusus* should be used only for the male described by Targioni Tozzetti (1881) and the Alpine and Apennine populations (fig. 6) should be named *B. alpinus* (see below).

Barbitistes alpinus Fruhstorfer, 1921 **stat. nov.**

Barbitistes obtusus, Brunner, 1882, Prodr. Orth. Eur.: 269 (partim).
Barbitistes obtusus, Redtenbacher, 1900, Derm. Orth. Oster. Deutsc.: 90.
Barbitistes serricauda, Nadig, 1918, Atti soc. Ital. Pavia: 129.
Barbitistes obtusus alpinus Fruhstorfer, 1921, Archiv. Naturg., 87: 179.
Barbitistes obtusus, Chopard, 1951, Faune de France, 56: 93.
Barbitistes obtusus, Galvagni, 1954, St. Trent. Sc. Nat., 31, 1-2: 75.
Barbitistes obtusus, Harz, 1976, Die Orthopteren Europas, I: 72 (partim).
Barbitistes obtusus, Nadig, 1987, Revue suisse Zool., 94-2: 267.
Barbitistes obtusus, Heller, 1988, Oekol. Forsch. Anwend, 1: 31.

Barbitistes obtusus, Failla et al., 1994, Checklist specie fauna d'Italia, 36: 7 (partim).
Barbitistes obtusus, La Greca, 1996, Boll. Mus. civ. St. nat. Verona, 20: 17 (partim).
Barbitistes obtusus, Thorens & Nadig, 1997, Atlas distr. Orth. Suisse: 60.
Barbitistes obtusus, Fontana, 1998, Boll. Mus. civ. St. nat. Verona, 22: 14.
Barbitistes obtusus, Ragge & Reynolds, 1998, Songs grass. crick. West. Eur.: 120.
Barbitistes obtusus, Fontana, 1999, Natura Vicentina, 3: 13.
Barbitistes obtusus, Defaut, 1999, Determ. Orth. Fr.: 9.
Barbitistes obtusus, Deafut, 1999, Syn. Orth. Fr.: 8.
Barbitistes obtusus alpina, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea (CD ROM).
Barbitistes obtusus, Fontana et al., 2002, Cavallette, Grilli, Mantidi e Insetti affini del Veneto: 286.

TYPE LOCALITY. Southern Switzerland, Monte Generoso, between Simonetta and Crocetta.

TYPE DEPOSITORY. Holotypus lost. Neotypus deposited in the Museo Civico di Storia Naturale di Milano (Italy).

ORIGINAL DESCRIPTION BY FRUHSTORFER, 1921 (translated from German):

Male smaller than male of *obtusus*, shorter, slimmer: head, thorax and abdomen more richly dark dotted, elytra with grooves and fossae deeply impressed and greatly darked. Female also more gracious than the valley form, fore femora vivaciously brown red dotted and elytra more highly yellow dotted.

.....

The *Barbitistes serricauda* mentioned by Nadig in Atti soc. Ital. Pavia 1918, 129 belongs, according to oral communication of Mr. Dr Nadig, to *obtusus alpinus* Fruhst. Contrarily to the higrophilous form of the valleys of *B. obtusus*, the *B. o. alpinus* prefers slopes with no much woods, stony, sunny. The first specimen of 29/VII/1919 at Generoso, between Simonetta and Crocetta, is described in rich plants formations, mixed with *Orphania denticauda*. A male was taking the sun in the afternoon on *Corylus* and is not escaped when I hurled the net to it, but is came out to show itself. I fell across a female at the same place the 1.IX, when *Gentiana asclepiadea* adorned that elevations, the first *Ant. pedestris*, *Lept. caudata* and *Eph. perforata* were appearing nearby. The *B. obtusus* appeared also at Monte Boglia the 15/VIII already on trunks of oaks and hazel-nut trees, as at Generoso, on red-hot, steep and stony but densely wooded slopes.

EXAMINED MATERIAL: ITALY, LIGURIA region, Savona province, Col del Melogno, Calizzano, 1030 m, 08.VI.1999, 1 ♂ 1 ♀, leg. P. F., coll. P. F.; Savona province, Urbe-Vara inf., Vara Inferiore, 600 m, 22.VII.1989, 2 ♂♂ and 1 ♀, leg. P. F., coll. P. F.; Savona province, Altare, VII.1973, 1 ♂, leg. Bordoni, coll. P. F.; Savona province, Colle di Melogno, 1030 m, 19.VIII.2001, 1 ♂ and 1 ♀, legg. P. F., R. Kleukers & F. M. B., coll. F. M. B.; PIEMONTE region, Cuneo province, Val Maira, Chiappera-Acceglio, Acceglio, 1700 m, 09.VIII.1995, 1 ♂, Osella, coll. P. F.; Alpi Graie, Val di Sca, Forno, 1200 m, 10.VIII.1993, 1 ♂, leg. G. Osella, coll. P. F.; Bocchetto, Val Sessera, Alpi Pennine, 05.VIII.1965, 1 ♂, Leg. G. Osella, coll. P. F.; Torino province, Valli Lanzo, Balme, 1400 m, VIII.1975, 1 ♂, leg. G. Osella, coll. F. M. B.; LOMBARDIA region: Lecco province, M. Barro (Galbiate), 780 m, N 45°49,849' EO 09°450', 12.VIII.2002, 1 ♂ (NEOTY-

PUS), leg. F. M. B & P. F.; TRENTINO ALTO ADIGE region, Trento province, Folgaria, 1200 m, 30.VII.1994, 1 ♂, leg. P. F., coll. P. F.; Trento province, Vallarsa, Valmorbia, 600 m, 07.VII.1995, 1 ♀, leg. P. F., coll. P. F.; Trento province, Val di Pejo, Celentino- Mga. Cel, Celentino, 1500 m, VIII.1995, 1 ♂, leg. L. Beretta, coll. P. F.; Bolzano (= Bozen) province, 08.IX.1998, 1 ♂, leg. D. Bianco, coll. P. F.; Trento province, Valle di Ledro, Vedravi, 800 m, 29.VI.2000, 1 ♂, leg. F. M. B., coll. F. M. B.; Trento province, Mount Pasubio, Strada degli Eroi, Galleria d'Avert, 21.VIII.2001,1 ♂, leg. A. Cogo, coll. F. M. B.; VENETO region, Vicenza province, Altopiano di Asiago, Asiago, 28.VIII.1988, 1 ♂ and 1 ♀, Leg. A. Battisti, coll. P. F.; Vicenza province, Altopiano di Asiago, Enego, loc. Cornetta, 900 m, 10.VIII.1995, 2 ♂♂ and 1 ♀, leg. P. F., coll. P. F.; Vicenza province, Prealpi Venete, M. Grappa, Camposolagna, Solagna, 1000 m, 04.VII.1995, 2 ♂♂, Fontana P, coll. P. F.; Italy, Veneto, Vicenza province, M. Grappa, Pove, Pove del Grappa, 450 m, 18.VII.1995, 1 ♂, leg. P. F., coll. P. F.; Vicenza province, M. Grappa, M. Colombera, Borso,Borso del Grappa, 1450 m, 28.VII.1996, 3 ♂♂, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza province, Prealpi Venete, M. Summano, Colletto, 900 m, 02.VIII.1997, 4 ♂♂ and 4 ♀♀, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza province, Prealpi Venete, M. Summano N, Velo d'Astico, Colletto Piccolo, 2000, 3 ♂♂ and 2 ♀♀, malayse trap, leg. D. Sommaggio, coll. P. F.; Italy, Veneto, Vicenza province, Prealpi Venete, Santorso- M. Summano, versante S, 1100 m, 14.VIII.1992, 1 ♂, leg. P. F., coll. P. F.; same locality, 1100 m, 19.IX.1992, 1 F, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza, Prealpi Venete, M. Summano, 24.VII.1994, 1 ♀, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza, M. Summano, 700 m, 06.VII.1997, 1 ♀, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza, M. Summano, 700 m, 06.VII.1997, 1 ♂, leg. P. F., coll. P. F.; 1 F, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza province, Prealpi Venete, M. Novegno, 1400 m, 14.VII.1994, 1 ♂, leg. P. F., coll. P. F.; Italy, Veneto, Vicenza province, M. Cornetto- M. Baffelan, 1600 m, 13.IX.1992, 1 ♂, leg. P. F., coll. P. F.; Verona province,Mount Baldo, Malga Valfredda, 24.VIII.2002, 2 ♂♂ and 2 ♀♀, legg. F. M. B. & P. Tirello, coll. F. M. B.; Verona province, Mount Baldo, between Spiazzi and Ferrara, 20.VIII.2002, 1 ♂, leg. F. M. B., coll. F. M. B.

DISTRIBUTION. *Barbitistes alpinus* lives in the Alps of South-eastern France, Southern Switzerland and Northern Italy, and in the Northern and Central Apennines (fig. 6).

Fruhstorfer (1921) described *Barbitistes obtusus alpinus* from Monte Generoso, on the border between Switzerland and Italy, where the first specimen was collected on 29.VII.1919 in a locality between Simonetta and Crocetta. We suppose that such locality is in Switzerland. Differences between *alpinus* and *obtusus*, as noticed by the Author, are: male of smaller size, with higher dark dotting of head, thorax and abdomen, and elitra with darker and deeper sulci and grooves; female equally smaller with fore femora richly red-brown dotted, elitra with yellow border more marked than in the valley form (*B. o. obtusus*). According to Fruhstorfer (1921) also ecological differences with *Barbitistes o. obtusus,* considered more hygrophilous, characterize his subspecies, *Barbitistes obtusus alpinus* preferring sunny and stony slopes, not much wooded.

We propose here to consider *Barbitistes alpinus* as a valid species and to refer to it all the Alpine and Apennine populations previously assigned to *B. obtusus*. We design as Neotypus of *Barbitistes alpinus* a male specimen from Monte Barro (Northern Italy) not far from the original type locality (Monte Generoso). Main features (figs 3-5) and measures (tab. 1) of the Neotypus are given:

Tab. 1 - Main measures (in mm) of neotypus of *Barbitistes alpinus*.

	MALE
Total length (from vertex to hind femur apex)	2.6 mm
Pronotum length	0.4 mm
Pronotum height	0.3 mm
Tegmina length	0.4 mm
Cerci length	0.47 mm
Hind femur length	1.6 mm
Hind femur height	0.27 mm

Genus *Poecilimon* Fisher, 1854

The genus *Poecilimon* Fisher, 1854 is placed by Otte (1997) in the tribe Barbitistini and numbers 135 taxa, mostly distributed in Balkan countries (mainly in Greece), Tuerkey, Asia Minor and Caucasus (fig. 44). Systematic position of this genus is very complex and morphological characters used to identify species are the shape of male cerci, subgenital plate, pronotum and tegmina and the female ovipositor; also strydulatory file shape has been used. Bioacoustic is very important too and many species were investigated by this point of view (i. e. see Heller, 1988; Ragge & Reynolds, 1998; Fontana et al., 2002). Type species of the genus is *P. jonicus* (Fieber, 1853).

Poecilimon laevissimus (Fisher, 1854)

Odontura laevissima Fisher, 1853, Orth. Europ.: 225.
Poecilimon laevissimus, Brunner v. W., 1878, Verh zool. Bot. Ges. Wien, 28: 48.
Poecilimon laevissimus, Kirby, 1906, Synonimic Catalogue of Orthoptera, 2 (1): 377.
Poecilimon laevissimus, Ramme, 1933, Mitt. Zool. Mus. Berlin, 19: 533.
Poecilimon laevissimus, Ramme, 1939, Mitt. Zool. Mus. Berlin, 24 (1): 46.
Poecilimon laevissimus, Harz, 1976, Die Orthopteren Europas, 1: 137.
Poecilimon laevissimus, Willemse, 1984, Fauna Graeciae 1, Catalogue of the Orthoptera of Greece: 38.
Poecilimon laevissimus, Heller, 1988, Oekol. Forsch. Anwend, 1: 56.
Poecilimon laevissimus, Failla et al., 1994, Checklist specie fauna d'Italia, 36: 7.
Poecilimon laevissimus, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).

TYPE LOCALITY. Sicily, Messina.

TYPE DEPOSITORY. Naturhistorisches Museum Wien.

EXAMINED MATERIAL: ITALY, Sicily, Messina province, Portella Mandrazzi (Peloritani Mountains), 1150 m, 03.VII.1969, 2 ♂♂ and 1 ♀, leg. Ronsisvalle, coll. P. F.; same locality, 1000 m, 23.VII.1961, 1 ♂, Leg. M. La Greca, coll. P. F.; Messina province, Monte Scuderi (Peloritani Mountains), 14.VI.1981, 1 ♂, leg. B. Massa, coll. B. Massa; Catania province, Mount Etna, Randazzo, loc. Piano di Rummolo, 800 m, 8.VI.2002, 2 ♂♂, 1 ♀, leg. P. F., coll. P. F.; GREECE, Is. Lefkas, Karià, 600-700 m, VII.1998, 1 ♀, leg. G. Osella, coll. P. F.; Is. Lefkas, Sivros,

10.VII.1998, 1 ♂, leg. G. Osella, coll. P. F.; Is. Lefkas, Agios Donatos, 29.VII.1997, 1 ♂, leg. G. Osella, coll. P. F..

DISTRIBUTION. Widely distributed in Greece, where it is known from Focide, Southern Peloponnesus, Lefkas Island, Kefallinìa Island, Zàkinthos Island; in Italy it is known only from north-eastern Sicily, where it lives on Mount Etna and on Peloritani Mountains (fig. 18).

BIOACOUSTICS OF *POECILIMON LAEVISSIMUS*. The only recordings of Sicilian specimens belong to a male and a female together reared in a cage; thus most of them consist of duetting between the pair. The male calling song seems to correspond well to the song of Greek specimens as described by Heller (1988). It consists of one ticking syllable, repeated at intervals of several seconds (Heller, 1988). In our recordings a male song in many cases is followed by a rustling female response that presumably consists of 2-3 syllables. The interval between the male song and the female response lasts about 30 ms and has already been described by Heller & von Helversen (1986). The interaction between male and female might explain the higher repetition rate of the male song in our recordings. Further researches on the bioacoustic behaviour of the Sicilian population are needed.

We were not able to find any difference between specimens of sicilian and greek populations, on the basis of the bioacoustics (fig. 17) and morphological characters (figs 9-16). Only the length of the tegminae is variable, even within specimens of the same population (Fer Willemse, pers. com.). Unusual distribution of *P. laevissimus*, spread only in Greece and Sicily, but absent from southern Italy, is difficult to understand.

Poecilimon varicornis (De Haan, 1842)

Locusta (*Ephippigera*) *varicornis* De Haan, 1842, Bijdrag. Kennis Orthopt.: 185.
Barbitistes trilineatus, Kirby, 1906, Syn. Cat. Orth. 2: 185.
Poecilimon varicornis, Ramme, 1933. Mitt. Zool. Mus. Berlin. 19: 519.
Poecilimon varicornis, Otte, Orthoptera species file, 7. Tettigonioidea: 127.
Poecilimon varicornis, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).

TYPE LOCALITY. Syria.

TYPE DEPOSITORY. ZMHB Berlin.

EXAMINED MATERIAL: LEBANON, Becharré, Zetternpass, 8.VIII.1928, 2100-2200 m, leg. R. Ebner, 4 ♂♂ and 3 ♀♀, det. Ramme (Natürhistorisches Museum Wien). SYRIA, 1 ♂ (incomplete), Leiden Museum.

ORIGINAL DESCRIPTION BY DE HAAN, 1842 (translated from Latin: see figs 45 and 46):

II Ovipositor short curved. Fore tibiae with four rows of spines, oval tympanal opening. (Barbitistes, B. Ephippigera, Steph.)

A) Ovipositor edge denticulated.

a) Black spotted abdomen; male subgenital plate upward curved.....13. s*erricauda*, Ch.

b) Abdomen with three black stripes; male subgenital plate straight.

α) Prothorax with white lateral line.....14. *trilineata*, n.sp.
β) Dark prothorax, marbly black .....15. *varicornis*, Klug.

15. L. (EPHIPPIGERA) VARICORNIS, N. SP.

Ovipositor short, curved, denticulate; fore tibiae with four row of spines, oval tympanal opening; dark vertex; black antennae; dark prothorax, marbly black; dark abdomen, black dotted and adorned with three continuous stripes; dark legs, with black stripes.

Syria. Long. Corp. 10'''.

DISTRIBUTION. Syria and Lebanon. The species is recorded from Syria only by type material. Furthermore, the meaning of the ancient labelling "Syria" was geographically wider than the actual political and administrative borders; probably the species is present only in Lebanon.

In the Natural History Museum of Leiden (The Netherlands) there is a badly preserved and incomplete specimen (figs 19-20) labelled "Syria", identified as the Type of *Locusta (Ephippigera) trilineata* De Haan, 1842 from Tripoli (african coast of Libya). Kirby (1906) stated that this specimen was a *Barbitistes* and after him Ramme (1933) wrote that it should not be referred to *Barbitistes trilineatus*, but to the species described by De Haan (1842) as *Locusta (Ephippigera) varicornis,* from Syria, and identified a female of *Poecilimon* preserved in the collections of the Berlin Museum as the type specimen of *L. (Ephippigera) varicornis* De Haan. He studied the variability and redescribed this species on the basis of a long series collected by Ebner and preserved in Wien Museum: consequently, he supposed that also the specimen in Leiden Museum had to be referred to *Poecilimon varicornis* (De Haan, 1842). We recently examined this incomplete specimen in Leiden Museum (figs 19-20) and the material of Ebner in Wien Museum (figs 21-27) and now we may confirm the identity of the specimen of Leiden as supposed by Ramme (1933).

Poecilimon syriacus Brunner, 1891

Poecilimon syriacus Brunner von Wattenwyl, 1891, Additamenta zur Monographie der Phaneropteriden, Verh. k. k. zool.-bot. Ges. Wien 41: 29.
Poecilimon syriacus, Kirby, 1906, Synonimic Catalogue of Orthoptera 2 (1): 314.
Poecilimon syriacus, Bei-Bienko, 1954, Fauna of the U.S.S.R. 2 (2): 314.
Poecilimon syriacus, Willemse, 1984, Fauna Graeciae I, Catalogue of the Orthoptera of Greece: 35.
Poecilimon syriacus, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).

TYPE LOCALITY. Lebanon: Beirut.

TYPE DEPOSITORY. Naturhistorisches Museum Wien.

EXAMINED MATERIAL: GREECE, Samos, 27.IV.1901, 1 ♂ and 1 ♀, det. Ramme, coll. Werner (Naturhistorisches Museum Wien); TURKEY, Gebeli (=Gebelliè), leg. Lenthner, 6 ♂♂ and 6 ♀♀, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien); Söört

b. Bitlis, Sikora (leg.), 6 ♂♂ and 3 ♀♀, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien); Söört b. Bitlis, Sikora (leg.), 1 ♂, coll. Naturhistorisches Museum Wien, det. Ramme; Söört südlich von Bitlis, Sikora (leg.), 1 ♂, coll. Naturhistorisches Museum Wien, det. Ramme; Urfa, Suwersak, Pietschmann, May 1914, det Ramme, coll. Naturhistorisches Museum Wien; Göksun, Amanus, Tŏlg, 1914, 1 ♂, coll. Werner (Naturhistorisches Museum Wien); Ladakia, Ladak, leg. Lenthner, 1 ♂ and 2 ♀♀, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien); SYRIA, 2 ♀♀ and 1 ♂, det. Ramme, coll. Brunner von Wattenwyl (Naturhistorisches Museum Wien); Batroun, 17.V.1935, 1 ♂ and 1 ♀, coll. Werner (Naturhistorisches Museum Wien); N. Syria, Sendschirli, Giaur Bagh, 1 ♂ and 1 ♀, coll. Naturhistorisches Museum Wien, det. Ramme; LEBANON, Tripolis, leg. Lenthner, 3 ♂♂, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien); JORDAN, Yerasch, 900 m, 17.VI.1963, leg. Silvio Bruno, 1 ♀, coll. P. F.; ISRAEL, Jerusalem, leg. Lenthner, 1 ♂ and 2 ♀♀, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien).

DISTRIBUTION. Samos (Egean Islands), Turkey to Israel and Jordan, along the coasts of Mediterranean Sea.

One of the authors (P.F.) received from Marcello La Greca one female of a Phaneropteridae collected in Jordan and labelled as *Barbitistes*. It is clearly a female of *P. syriacus* Brunner, 1891, and represents the first record for Jordan.

Austrodontura n. gen.

Ragge (1980), discussing on the only known female of *Odontura capensis* Walker, 1869, considered also a male specimen from the collection of the Natural History Museum of London and wrote: "it is clearly congeneric with this female but is probably a distinct, undescribed species".

After the examen of the above mentioned material, we agree with Ragge (1980) both on the undescribed species and on the unlikely placement of *capensis* in the genus *Odontura*; thus we describe here the new genus *Austrodontura*, including *Odontura capensis* and the male specimen belonging to a new species (below described).

DIAGNOSIS

Head: Fastigium scarcely elevated (fig. 35), eyes oval and protruding (figs 30, 31).
Thorax: Pronotum subtrapezoidal in transversal section, evident lateral carinae discontinuously rising and marked with dark spots, hind margin of the lobi deflexi largely rounded, tegminae longer than pronotum with campus subcostalis and radialis densely reticulated (figs 30, 31).
Abdomen: Subconical and weakly inward curved cerci with a strong apical tooth (fig. 32), male subgenital plate narrow with a deep apical V-shaped incision, after that ending with two long and acute lobes (figs 33, 34).

TYPE SPECIES: *Austrodontura raggei* n. sp. (fig. 28).

Austrodontura raggei n. sp.

TYPE LOCALITY. South Africa, Bizana Province, Pandaland East, Cape Province,

TYPE DEPOSITORY. British Museum of Natural History.

EXAMINED MATERIAL: SOUTH AFRICA, Bizana Province, Pandaland East, Cape Province, January 1932, 1 ♂, legit K. H. L. Key, NHM London (figs 28, 30-35).

DESCRIPTION. *A. raggei* n. sp. differs from *A. capensis* (Walker, 1869) for pronotum shape and in particular for the lateral carina less rising and the rounded hind margin of lobi deflexi (see diagnosis of *Austrodontura* n. gen. and figs 28 and 30-35).

DISTRIBUTION. South Africa.

DERIVATIO NOMINIS. Named after Dr D. R. Ragge (NHM of London) who kindly provided us with important literature and suggested us to examine the specimen on which the new species *A. raggei* is here described.

Austrodontura capensis (Walker, 1869) **n. comb.**

Odontura capensis Walker F., 1869, Catalogue of the specimens of Dermaptera Saltatoria in the Collection of the British Museum, 2: 242.
Odontura capensis, Kirby, 1906, Synonimic Catalogue of Orthoptera, 2(1): 387.
Odontura capensis, Ragge, 1968, Bull. Br. Mus. Nat. Hist. Ent. 22(2): 91.

TYPE LOCALITY. South Africa

TYPE DEPOSITORY. British Museum of Natural History.

EXAMINED MATERIAL: SOUTH AFRICA, R.I.S., 1 ♀, NHM London (figs 29, 36-39).

DISTRIBUTION. South Africa.

Austrodontura capensis (Walker, 1869) is known up to date for a single female (fig. 29), that is the only female know for the genus too. The ovipositor is as short as the pronotum, regularly up-curved and scarcely toothed at the apex (fig. 38).

Genus *Odontura* Rambur, 1839

The genus *Odontura* Rambur, 1839 (fig. 8) is placed by Otte (1997) in the tribe Odonturini and numbers 19 taxa, mostly distributed in west Mediterranean region (fig. 44). Some species are recorded from South America and South Africa, which position is discussed in this paper. The systematic of the genus is not very defined and morphological characters mostly used for the identification are the same of other brachypterous Phaneropterinae: the shape of male cerci, subgenital plate, pronotum and tegmina and the female ovipositor. Bioacoustics of the genus *Odontura* is unknown. Type species of the genus is *O. glabricauda* (Fabricius, 1794) originally ascribed to the genus *Barbitistes*.

Odontura trilineata (De Haan, 1842) **n. comb.**

Locusta (*Ephippigera*) *trilineata* De Haan, 1842, Bijdrag. Kennis Orthopt.: 185.
Barbitistes trilineatus, Kirby, 1906, Syn. Cat. Orth. 2: 381.
Barbitistes trilineatus, Otte, Orthoptera species file, 7. Tettigonioidea: 115.
Barbitistes trilineatus, Naskrecki & Otte, 1999, Illustrated Catalog Orthoptera, I. Tettigonioidea. (CD ROM).

TYPE LOCALITY. Africa (Libya), Tripoli.

TYPE DEPOSITORY. type lost.

ORIGINAL DESCRIPTION BY DE HAAN, 1842 (translated from Latin: see figs 45, 46):

II Ovipositor short curved. Fore tibiae with four rows of spines, oval tympanal opening. (Barbitistes, B. Ephippigera, Steph.)

A) Ovipositor edge denticulated.

a) Black spotted abdomen; male subgenital plate upward curved.....13. *serricauda*, Ch.

b) Abdomen with three black stripes; male subgenital plate straight.

α) Prothorax with white lateral line.....14. *trilineata*, n.sp.

β) Dark prothorax, marbly black .....15. *varicornis*, Klug.

14. L. (EPHIPPIGERA) TRILINEATA, N. SP.

Ovipositor short, curved, denticulate; fore tibiae with four rows of spines, oval tympanal opening; vertex usually with two lines; yellow antennae; prothorax sub-angulated, yellow, with white lateral corners; median line with dark margins and extending to the head; yellow abdomen, adorned with three dark and continuous stripes; yellow legs.

Long. Corp. 9''. Tripoli in the African coasts.

DISTRIBUTION. Libya (Tripoli).

On the basis of the few morphological characters given by De Haan (1842), in particular the yellow antennae, the dorsal pattern and the sub-angulated prothorax, we can assume that this species belongs to the genus *Odontura* (see fig. 8). Biogeographical considerations on the known distribution of the genus, should confirm this statement. *Odontura trilineata* is the most eastern species of the genus but its current distribution is unknown, since any specimen was collected after its description and the genus was not hitherto recorded from Libya (Massa, 1998).

Genus *Dichopetala* Brunner von Wattenwyl, 1878

Dichopetala transfuga (Brunner von Wattenwyl, 1878) **n. comb.**

Odontura transfuga Brunner v. W., 1878, Monographie der Phaneropteriden: 72.
Odontura (Odonturella) tranfuga, Kirby, 1906, Synonimic Catalogue of Orthoptera, 2 (1): 386.

EXAMINED MATERIAL: BRAZIL, Bahia, Saussure, 1 ♀ Syntype, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien); Bahia, Bahia blanca em claros, 1

♀ Syntype, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien) (figs 40-43); Bahia, Bahia blanca em claros, 1 ♀ Syntype, det. Brunner von Wattenwyl, coll. Brunner von Wanttenwyl (Naturhistorisches Museum Wien).

TYPE LOCALITY. Brazil: Bahia Blanca.

TYPE DEPOSITORIES. Museum of Natural History of Geneva, Naturhistorisches Museum Wien.

DISTRIBUTION. Brazil.

Following Brunner (1878), main morphological charachters of females are neither those characterizing the genus *Odontura* Rambur, 1839, nor those of *Odonturella* I. Bolivar, 1900. In particular, the female pronotum is longer than in *Odontura*, but with the postero-lateral angle widely rounded (fig. 42). We propose to transfer this species to the genus *Dichopetala* Brunner von Wattenwyl, 1878, a very heterogeneous genus till now known from North to South America.

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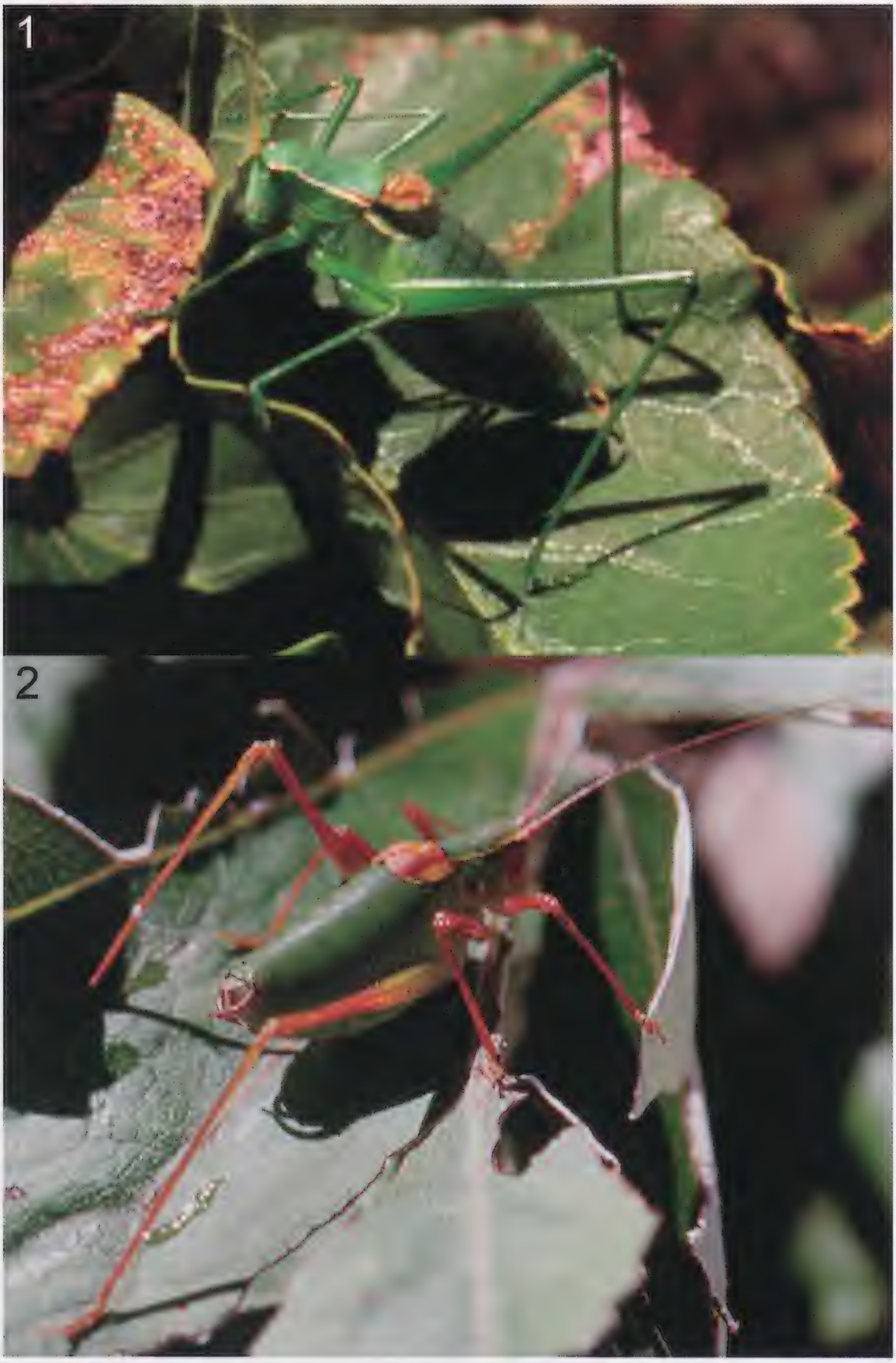
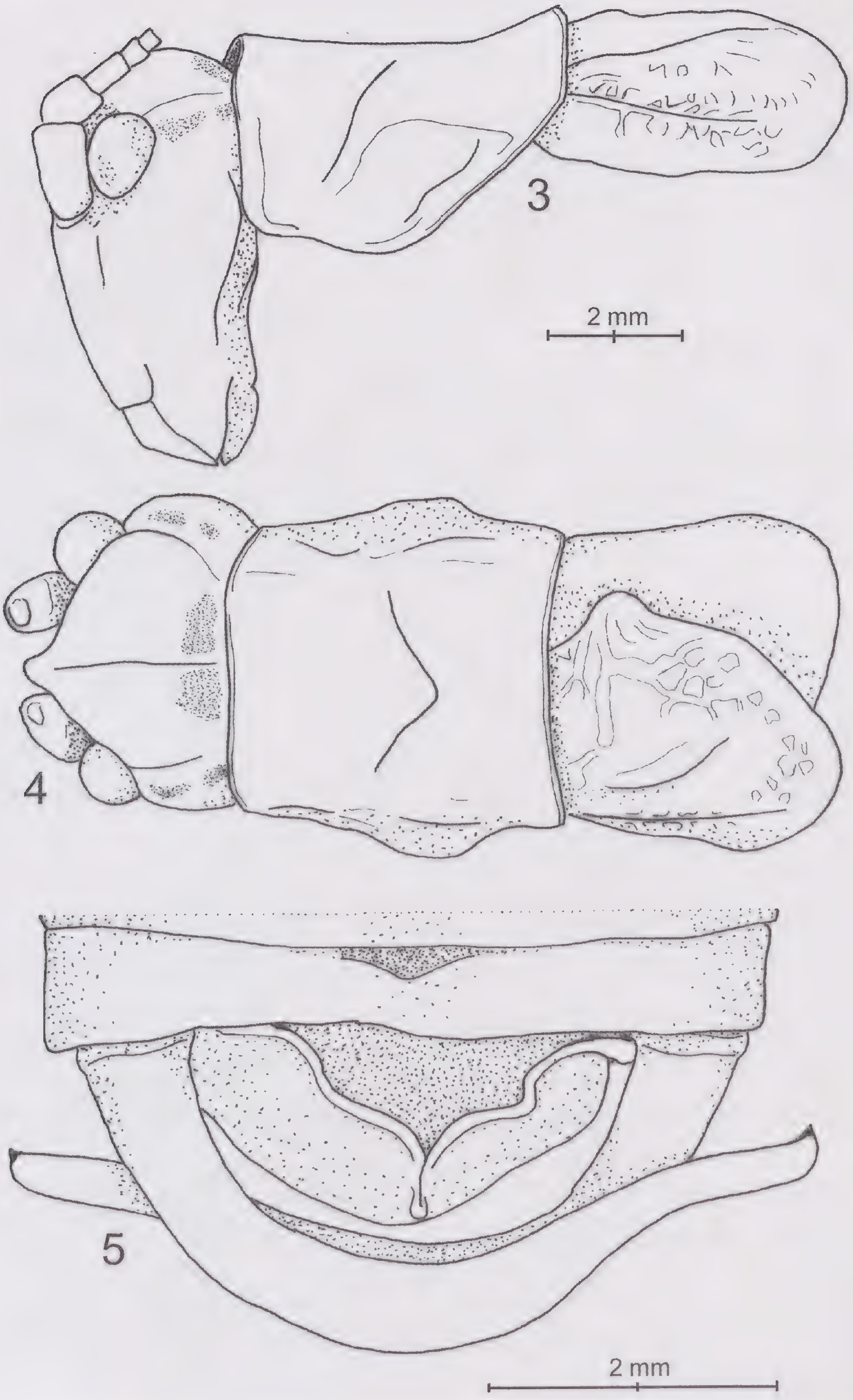
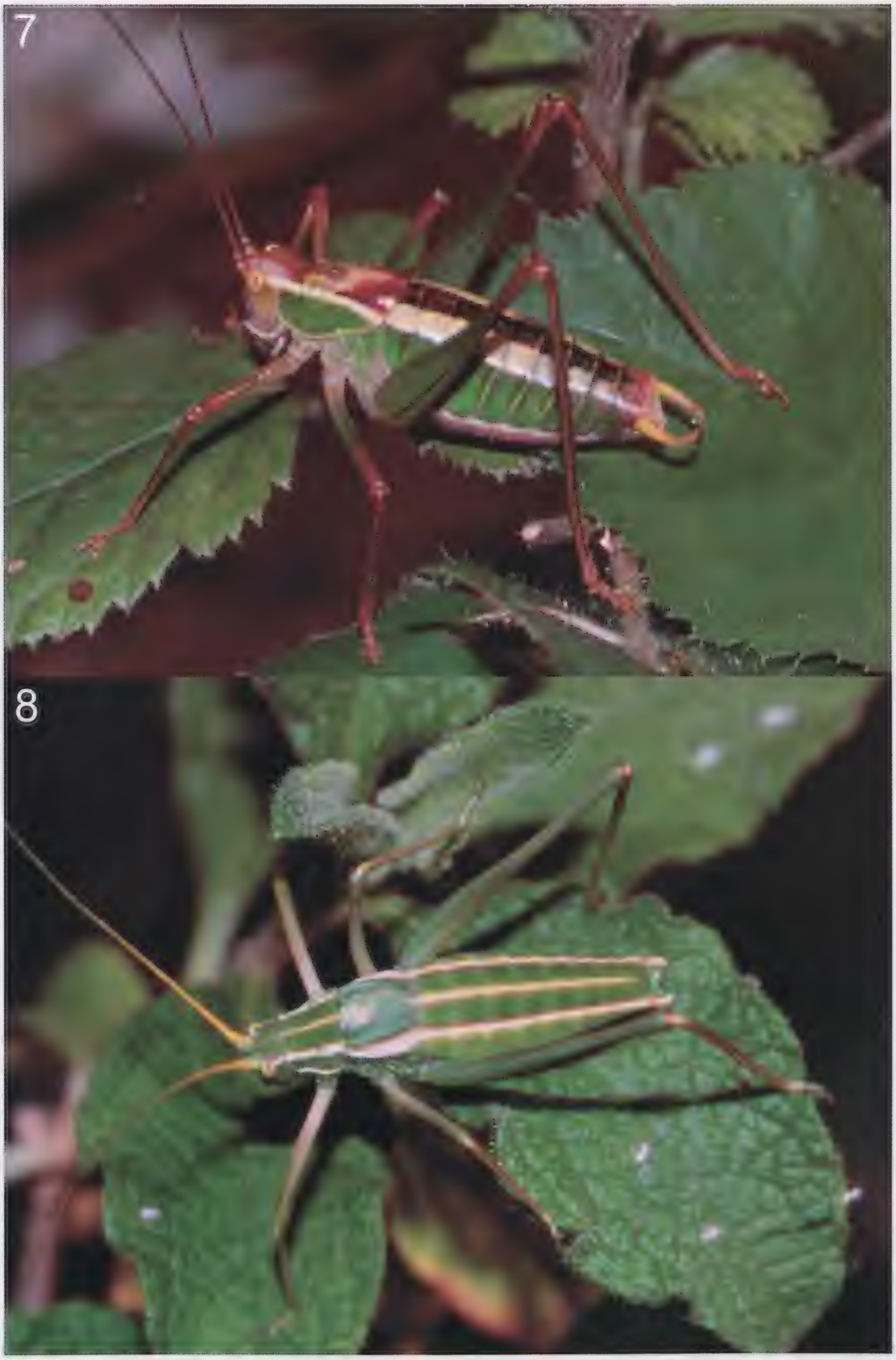


Figs 1-2. 1 - *Isophya modestior* Brunner, 1882, male, M. Grappa (VI), Veneto, Italy; 2 - *Barbitistes alpinus* Fruhstorfer, 1921, male, M. Novegno (VI), Veneto, Italy. (Photos by P. Fontana).

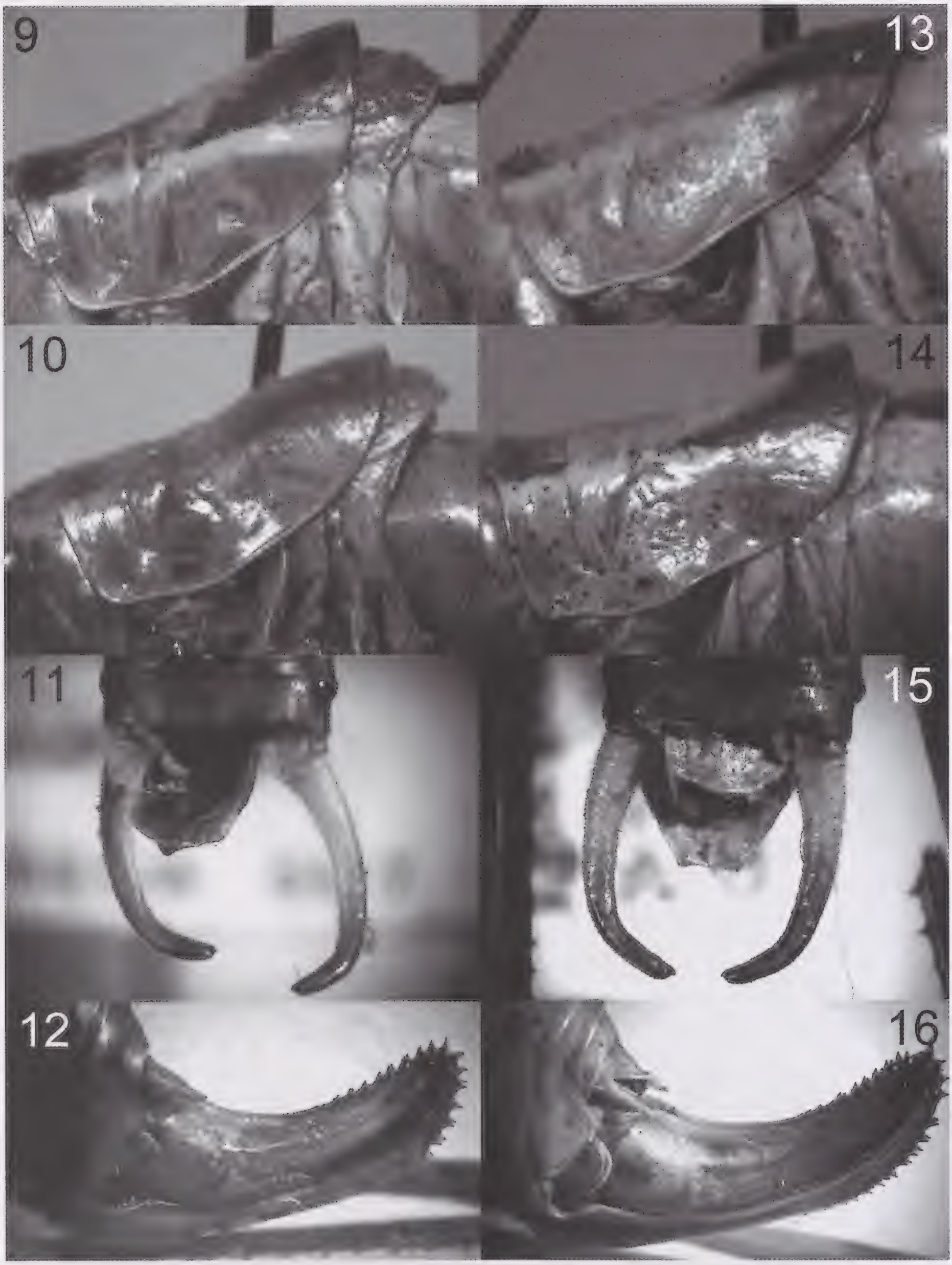


Figs 3-5. *Barbitistes alpinus* Fruhstorfer, 1921, male neotype: 3 - lateral view of head, pronotum and tegmina; 4 - dorsal view of head, pronotum and tegminae; 5 - dorsal view of abdominal apex. (Drawings by P. Tirello).

Fig. 6. Distribution map of *Barbitistes alpinus* Fruhstorfer, 1921 and *Barbitistes obtusus* Targioni Tozzetti, 1881.



Figs 7-8. 7 - *Poecilimon laevissimus* (Fisher, 1854), male, Randazzo (CA), Sicily, Italy; 8 - *Odontura arcuata* Messina, 1981, male, Castelbuono (PA), Sicily, Italy.. (Photos by P. Fontana).



Figs 9-16. *Poecilimon laevissimus* (Fisher, 1854): 9-12 - two different males pronotum from left lateral view, male cerci dorsal view and female ovipositor left lateral view, Sicily, Portella Mandrazzi; 13-16 - two different males pronotum from left lateral view, male cerci dorsal view and female ovipositor left lateral view, Greece, Is. Lefkas. (Photos by P. Fontana).

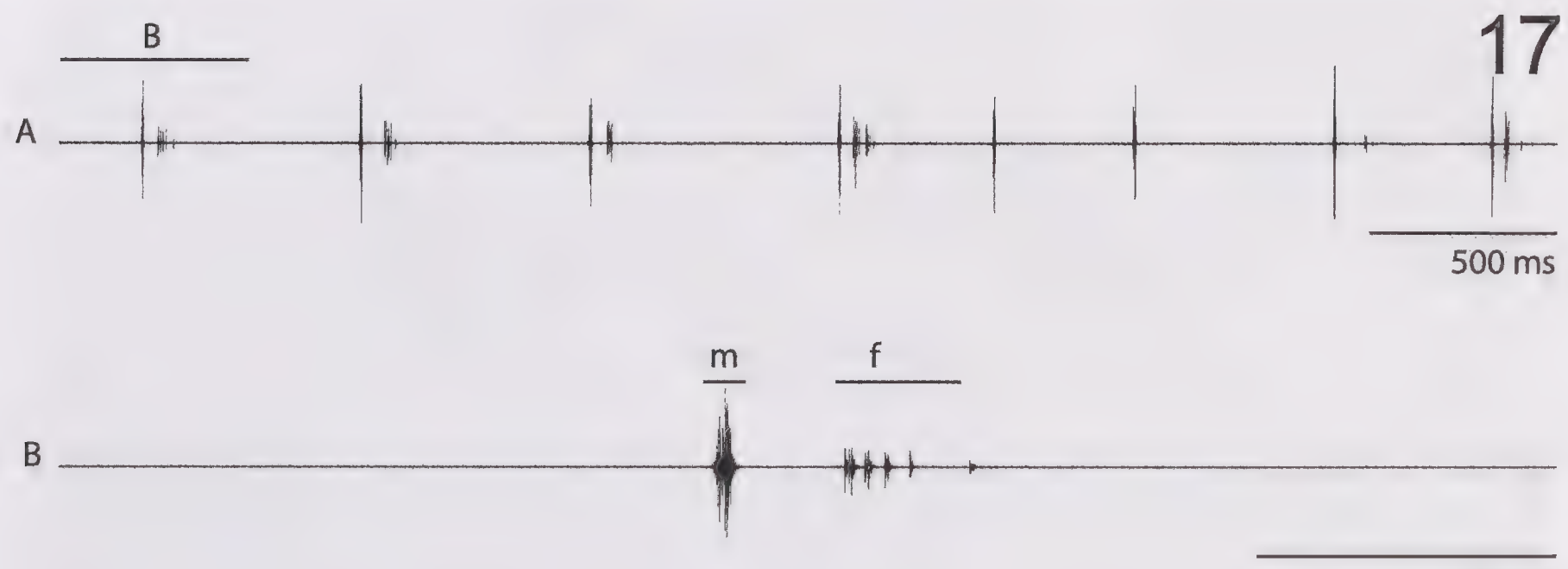


Fig. 17. A-B: Oscillograms of the song of *P. laevissimus* from Sicily (Randazzo, loc. Piano di Rummolo, 800 m), recordings by P. Fontana. A. overview of 4 s. showing the male song in many cases shortly followed by the female response; B. detail of 500 ms, showing male song (m) and female (f) response. (Oscillograms by B. Odé).

Fig. 18. Distribution map of *Poecilimon laevissimus* (Fisher, 1854).

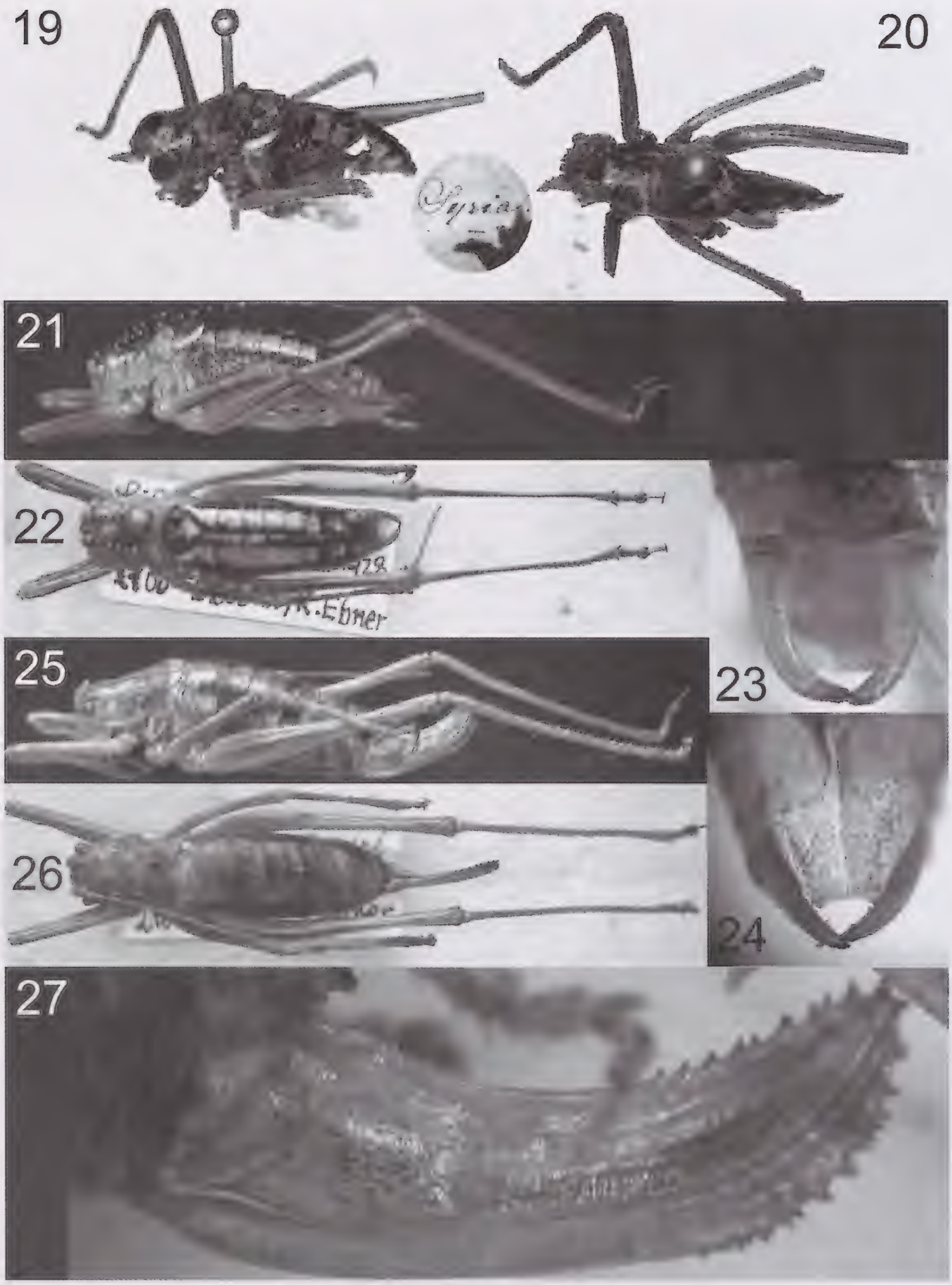
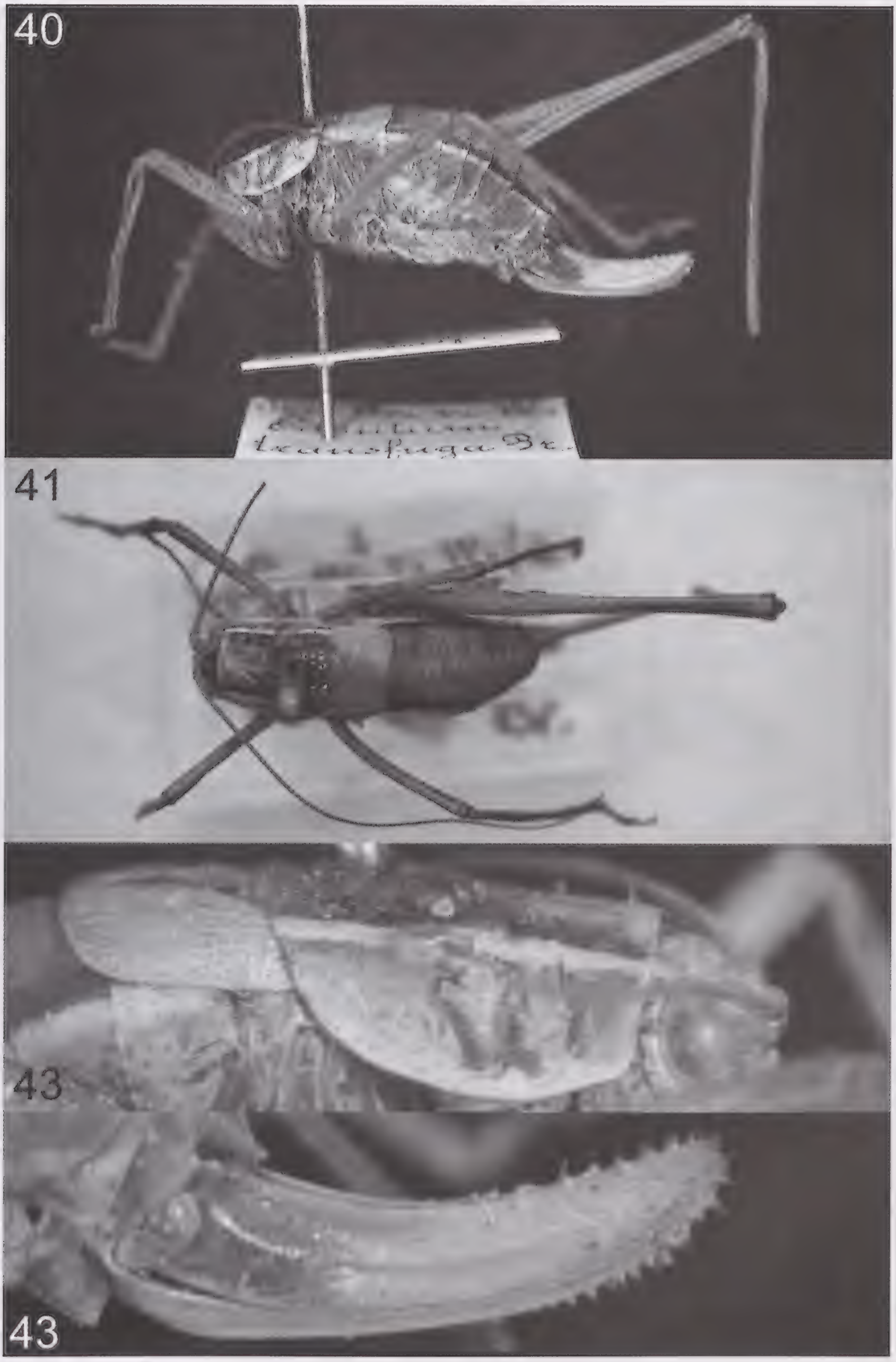


Fig. 19-27. *Poecilimon varicornis* (De Haan, 1842): 19-20 - Syria (Leiden Museum) male from lateral and dorsal view (Photos by Roy Kleukers); 21-24 - Lebanon, Becharrè, Zetternpass 2100-2200 m, 8.VIII.1928, leg. R. Ebner (Wien Museum), male from lateral and dorsal view, male cerci from dorsal and ventral view; 25-27 - Lebanon, Becharrè, Zetternpass 2100-2200 m, 8.VIII.1928, leg. R. Ebner (Wien Museum), female from lateral and dorsal, ovipositor from left view. (Photos by B. Massa).

Figs 28-29. *Austrodontura* n. gen. 28 - *Austrodontura raggei* n. gen. and n. sp., South Africa, Bizana Province, Pandaland East, Cape Province, male Holotype; 29 - *Austrodontura capensis* (Walker, 1869) n. comb., South Africa, male Holotype. (Photos P. Fontana).

Figs 30-39. *Austrodontura* n. gen. 30-35 - head, pronotum and tegmina left lateral and dorsal viewes, cerci from dorsal view, subgenital plate from the back, cerci and subgenital plate from left lateral view and fastigium anterior view of *Austrodontura raggei* n. gen. and n. sp., South Africa, Bizana Province, Pandaland East, Cape Province, male Holotype; 36-39 - head, pronotum and tegmina left lateral and dorsal viewes, ovipositor left lateral view and fastigium anterior view of *Austrodontura capensis* (Walker, 1869) n. comb., South Africa, male Holotype. (Photos P. Fontana).



Figs 40-43. *Dichopetala transfuga* (Brunner von Wattenwyl, 1878), n. comb., Syntype, female, Brazil, Bahia. 40-41 - Syntype from lateral and dorsal view; 42 - pronotum from right view; 43 - ovipositor from left view. (Photos by B. Massa).

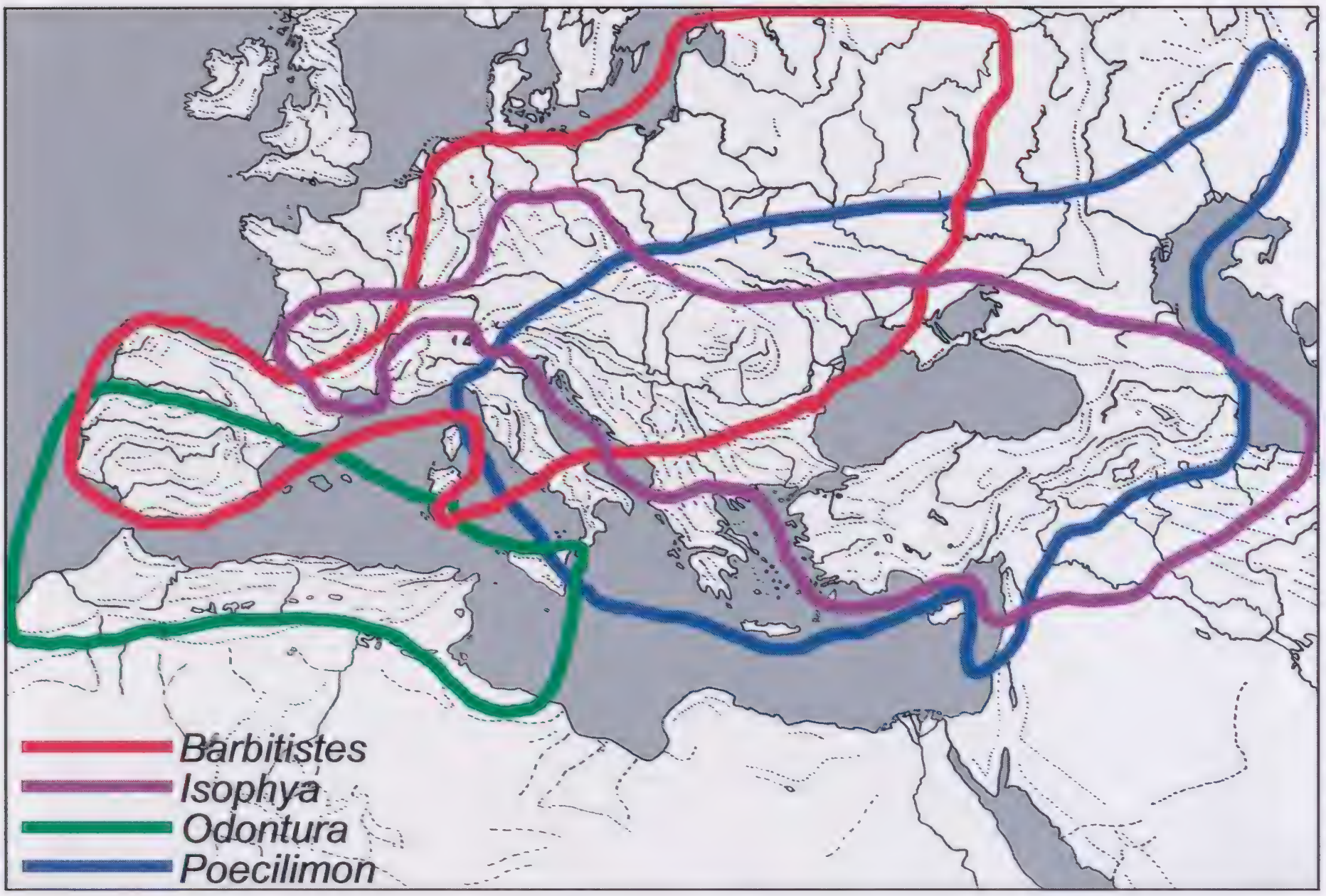


Fig. 44. Distribution map of the genera *Barbitistes* Charpentier, 1825, *Isophya* Brunner, 1878, *Odontura* Rambur, 1839 and *Poecilimon* Fischer, 1854.

45

II. Vagina brevis recurvata. Tibiae anticae quadriseriatim spinosae, foramine ovato. Caput inter antennas acutum. (Barbitistes, B. Ephippigera, Steph.)

A.) Vagina margine denticulata.

a.) Abdomen nigro-punctatum; articulo postremo infero maris sursum incurvato. 13. *Serricauda*, Ch.

b.) » vittis 3 nigris; articulo postremo infero maris recto.

α.) Prothorax linea laterali alba. . . . . 14. *Trilineata*, n. sp.

β.) » fuscus, nigro-marmoratus. . . . . 15. *Varicornis*, Klug.

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14. L. (EPHIPPIGERA) TRILINEATA, n. sp.

Vagina brevi, recurvata, denticulata; tibiis anticis quadriseriatim spinulosis, foramine ovato; vertice supra plerumque bilineato; antennis flavis; prothorace subangulato, flavo, angulis lateralibus albidis linea intus fusco-marginata in caput producta; abdomine flavo, fasciis tribus nigris continuis picto; pedibus flavis. Long. corp. 9‴. Tripoli in littore Africano.

15. L. (EPHIPPIGERA) VARICORNIS, Klug.

Vagina brevi recurvata, denticulata; tibiis anticis quadriseriatim spinulosis, foramine ovato; vertice fusco; antennis nigris, luteo-variegatis; thorace fusco, nigro-marmorato; abdomine fusco, nigro-punctato et fasciis tribus continuis picto; pedibus fuscis, nigro-lineatis. Syria. Long. corp. 10‴.

47

V. **Barbitistes obtusus.**

Laete virens; antennarum filamento, occipite superne ochraceo – infumatis; vittis postocularibus, et carinalibus in pronoto sulphureis.

Pronotum breve lineare constrictum, laeviter medio superne depressum, lobis lateralibus trapezoideis, margine postico obliquo, longiori.

Elythrae basi liberae, pronoti sublongiores, sinistra superimposita, apice rotundata, margine destro, basi inciso, subbiloba.

Squama maris super analis basi lata, elliptico rotundata. Cerci graciles praelongi, decussati. Lamina subgenitalis latissima cochleariformis, basi medio carinata, postice obtusa, medio profunde anguste fissa, lobis trasverse truncatis, margine interno contiguis.

Species sardoa Kalaritana, cujus foem. deest. — *B. serricaudae* quam proxima, squama subgenitali latiore, prothorace breviori, coloribusque diversa. *B. serricaudae* var. Brunn. Wattenw. quoque differt, margine laminae subgenitalis postico recto nec undulato, cercisque longioribus et locibus (Sardinia nec Helvetia vel Tyrolia) (1).

Long	Mill.	20
» pron	»	4
Femora ant	»	7
» post	»	15,5

Figs 45-47. 45, 46 - Original description of *Odontura trilineata* (De Haan, 1842) (sub *Barbitistes* (*Ephippigera*) *trilineata*) and *Poecilimon varicornis* (De Haan, 1842) (sub *Locusta* (*Ephippigera*) *varicornis*); 47 - Original description of *Barbitistes obtusus* Targioni Tozzetti, 1881. For translations see the text.

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Fer WILLEMSE & Luc WILLEMSE

Eupholidoptera cephalonica sp. nov. and diagnosis of *E. epirotica* from Western Greece (Orthoptera Tettigoniidae)

Abstract - A new species of *Eupholidoptera*, *E. cephalonica* **n. sp.** is described from the Ionian island of Kefallinia. Based on newly collected material a diagnosis is presented for *E. epirotica* Ramme, 1927 until now only known from its type series. Opportunity is taken to present a distribution map of *Eupholidoptera* from Western Greece.

Riassunto - Eupholidoptera cephalonica*, nuova specie e diagnosi di* E. epirotica *della Grecia occidentale (Orthoptera Tettigoniidae).*
Gli Autori descrivono una nuova specie, *Eupholidoptera cephalonica* **n. sp.**, della Grecia, affine ad *E. epirotica* (Ramme, 1927); di quest'ultima, nota solo per la serie tipica e recentemente riscoperta, forniscono ulteriori dati morfologici. Infine sintetizzano in una cartina la distribuzione finora conosciuta delle specie di *Eupholidoptera* nella Grecia occidentale.

Key words: Tettigoniidae, Greece, Ionian Islands, new species, distribution map

The genus *Eupholidoptera* Maran, 1953 ranges from Southeastern France to the Near East. Up to date about 50 species are recognized. Some are widely distributed but the range of most of them is restricted to small areas. Ramme (1951) and Harz (1969) recorded nine and Willemse (1980) 15 species and subspecies from Greece. This number has increased up to 20 since. Ten of these are endemic to Kriti (= Crete) (Willemse & Heller 2001). Again a new Greek species is recognized and described below. It is a close ally of *E. epirotica* (Ramme, 1927). The latter was known only from the type series. After about a century the species was re-discovered and opportunity is taken here to give more details of *E. epirotica*.

Unless otherwise stated, material has been collected by the authors and is deposited in the collection Willemse.

DESCRIPTIONS

Eupholidoptera epirotica (Ramme, 1927) (figs 1-3, 7-9, 13-15, 19-20, 25-27, 33-34, 40-41)

MATERIAL STUDIED. Greece, Aetolia/Akarnania: Loutrakion (70 m) 1.VII.1986 (11 ♂♂, 3 ♀♀); Babini (W of Agrinion) 23.VI.1986 (2 ♂♂); Drimos (E of Vonitsa) 2.VII.1986 (3 ♂♂, 1 ♀); Aktion (NW of Vonitsa) 1.VII.1986 (6 ♂♂, 1 ♀); Mitikas (S of Vonitsa) (10 m) 23.VI.1986 (9 ♂♂, 3 ♀♀), 9.VII.1986 (1 ♀); surr. Monastirakion (200 m) 9.VII.1986 (1 ♀); Mt Akarnanika, above Thirion (800-1380 m) 27.VII.1987 (19 ♂♂, 5 ♀♀) (another pair of the latter series in collection A. Nadig); surr. Thirion (300 m) 11.VII.1986 (2 ♂♂, 2 ♀♀); Mt Akarnanika (1000-1450 m) 9-10.VII.1986 (6 ♂♂, 3 ♀♀); Mt Akarnanika, 1 km N of Thirion (400 m) 18.VII.2000 (5 ♂♂, 4 ♀♀).

DIAGNOSIS. The species is characterized by the abdominal terminalia resembling those of the type species *E. chabrieri* (Charpentier, 1825) and allied taxa in combination with a different titillator (Figs 1-3). The fused apical part of the titillator lacks any trace of lateral wing-like expansions; besides this part is long, slender, inflated, laterally also convex, surface smooth with a median longitudinal groove and over its entire length tapering regularly towards the base. The male cercus (figs 25-27) is slightly longer than in *E. chabrieri*, the basal tooth equally robust. In the male the median emargination of the hind margin of the last abdominal tergite is slightly wider than in *E. chabrieri*. Subgenital plate closely resembles that of *E. chabrieri*; the median extension of the distal part of the inner margin of the apical lobe often slightly expressed (figs 13-15); the armature near the base of the stylus variable: the tip of the apical processes with a single or two spines of equal length but often of different size, even within a single specimen (figs 7-9). The male stridulatory file as usual, shortest distance between proximal and distal teeth about 4.2-4.9 mm, greatest width of teeth 0.12 mm, total number of teeth 102-111, spacing of teeth in mid third 20-22 per mm. Female subgenital plate (figs 19-20) as in *E. chabrieri*.

The colour pattern of the pronotum (figs 33-34) varies a little but the dark markings on the dorsum of the prozona always conspicuous in both sexes and quite distinct from *E. chabrieri* and its closest relatives (e.g. the taxa *E. schmidti*, *bimucronata*, *garganica*, regardless whether considered as species or subspecies).

BIOACOUSTICS. The song can be heard in daytime but more often at twilight and night. The calling song consists of a long series of syllables, the syllables isolated from each other by intervals of about 0.5-1.5 s (fig. 40) roughly the same as in other species of the genus (Heller 1988).

HABITAT. Coarse herbage, bramble thickets, prickly bushes, shrubby areas, sometimes poor vegetation consisting mainly of *Quercus coccifera* L. At one site (surroundings of the village of Thirion, Mt Akarnanika) the population was abundant and specimens were found on the asphalt road, feeding on traffic victims of their own species (July 1986 and 1987). Visiting this spot many years later (July 2000), the situation was completely similar.

DISTRIBUTION. The species was known only from the type series, 4 ♂♂ and 2 ♀♀, "Epirus Erber Coll. Br. v. W." (studied; Willemse 1980). These specimens came in Brunner's collection from Josef Erber (1824-1884), an insect dealer in Vienna. Precise data are missing. The range of the recently collected material covers the northwestern part of the district of Aetolia/Akarnania, the extreme southwestern mainland of Greece (fig. 41). Though biogeographically this part of Greece may be considered the southernmost part of Ipiros (= Epirus), it belongs to Sterea Hellas (= Central Greece).

It is noteworthy that there is more *Eupholidoptera* material in Brunner's collection originating from Erber: one pair also labelled 'Epirus' but belonging to *E. chabrieri schmidti* and one male labelled 'Corfu' and belonging to *E.chabrieri garganica* (both studied and discussed in Willemse 1980). Kaltenbach (1967) records a single female of *E. epirotica* (Werner's collection) labelled "Korfu" (= Kerkira) (studied; Willemse 1980).

The origin of Werner's specimen is not clear (from Erber or a gift from Brunner to Werner or collected by Werner himself?). Schmidt (1981) described the song of *Eupholidoptera* males. The specimens originated from Korfu (= Kerkira) and he named them *E. chabrieri epirotica* without any reference to the black pattern of the pronotum or typical titillator. When visiting Kerkira, we collected 67 males and females of *Eupholidoptera* from 10 localities scattered all over the island (fig. 41). All of them agree with *E. chabrieri garganica* and lack the black coloration of the pronotum and typical titillator in *E. epirotica.* Therefore, we consider both records of *E. epirotica* from the island of Kerkira as doubtful and its occurrence there certainly needs confirmation. Consequently the Kerkira and "Epirus" localities of *E. epirotica* in map 64 of Willemse (1984) are omitted in the distribution map (fig. 41) given here.

DISCUSSION. Distinction of *E. epirotica* from nominate *E. chabrieri* and its allied taxa such as *schmidti* (Fieber, 1861) and *garganica* La Greca, 1959 as well as from other Greek species is discussed in Willemse (1980, 1986). However, the distinction between *E. epirotica* and *E. megastyla* (Ramme, 1939) needs an additional note. The range of *E. epirotica* borders on that of *E. megastyla*; apparently both species are parapatric. Populations of *E. megastyla* occurring close to those of *E. epirotica* become congruent in their coloration. Both species differ clearly from each other in the titillator and commonly also in the coloration of the dorsal side of head and particularly of the prozona of pronotum: in *E. epirotica* with a wide median solid black pattern (figs 33-34), in *E. megastyla* uniformly colored without such an obvious pattern (figs 37-38). In the parapatric populations of *E. megastyla*, however, the backside of head and especially of pronotum (figs 31-32) is like that of *E. epirotica*. The males are readily identified by their titillators but females lack reliable distinct characters. We found this 'black pronotum' colour variation of *E. megastyla* only in populations in the district of Aetolia/Akarnania (fig. 41): Anoxiatikon and Loutron (eastern side of Gulf of Amvrakikos) [partly collection J. Tilmans], Trifos (southwest of Amfilochia) [collection K.-G. Heller], Sklavaina (western side of Mt Akarnanika) and Mt Koutsiliaris (Acheloos Delta). The coloration of *E. megastyla* is known to be variable (figs. 37-38) (Willemse 1980; Nadig 1986) but the occurrence of solid black markings on the dorsum of the prozona of the pronotum (figs 31-32) is, as far as known, not found in other populations of this species.

Eupholidoptera cephalonica n. sp. (figs 4-6, 10-12, 16-18, 21-24, 28-30, 35-36, 39, 41)

MATERIAL STUDIED. ♂ holotype, ♀ allotype, 4 ♂ ♂ paratypes: 'Hellas (Kefallinia), Mt Ainos plateau W of Tsarkanianas (550 m), 3.VII.1986, L. Willemse'; additional paratypes: Kefallinia, Limni Avikon (A.Nikolaos) (100 m) 5.VII.86, L. Willemse (3 ♂ ♂); 3-5 km S of Sami, 4.VII.86, L. Willemse (1 ♂, 1 ♀); surr. Patrikata (500 m) 4.VII.86, L. Willemse (2 ♀ ♀); surr. Neokhorion (400 m) 6.VII.86, L. Willemse (1 ♀); surr. Dhavgata, 7 km N of Argostolion (250 m) 4.VII.86, L. Willemse (2 ♂ ♂, 1 ♀); Mt Ainos (1000-1300 m) 2-3.VII.86, L. Willemse (1 juv. ♂).

DESCRIPTION. Male. General appearance robust, pronotum, elytra, legs and abdominal terminalia resembling type species, *E. chabrieri*. Hind femur 2.0-2.3 as long as pronotum. Lower inner margin of hind femur with 0-3 tiny spines.

Elytra dorsally completely covered or only just extending beyond hind margin of pronotum. Stridulatory file of left elytron: shortest distance between proximal and distad teeth 4.0-4.4 mm, greatest width of teeth 0,12 mm; number of teeth including most proximal and distal ones about 98, widest spacing in mid third of file, about 21 teeth per mm.

Last abdominal tergite (figs 23-24) slightly depressed in the middle with flattened U-shaped medial excision, on either side tapering into a short tooth pointing ventrodistal; width of median excision between one fourth to one third of the width of the tergite.

Cercus (figs 28-30) about one fourth longer than length of last tergite, slightly in- and upcurved, widest at base with strong basal tooth, tip obtusely pointed as usual in the genus; basal tooth from almost as long to twice longer than thick, tip hook-like, sharp.

Subgenital plate incised over about half its length, apical lobes slightly tapering inner margin with a slightly defined median extension (figs 16-18); tips of lobes (figs 10-12) long and slender, terminating into commonly one, but often two spines of different or sometimes equal size; styli slender, length slightly variable, roughly two thirds of cercus length.

Titillator (figs 4-6) with basal parts extending and curved laterally as in other *Eupholidoptera*; apical parts fused with median longitudinal groove, without any trace of lateral expansions ('wings'), strongly inflated and laterally convex, narrow at its base and widening distad, strongest at the base and by far less widening further distad, greatest width of the fused part less that twice its median length; apical parts terminating into divergent but slightly recurved apices, tips pointed and reaching in situ just beyond hind margin of tenth abdominal tergite.

General coloration yellowish brown. Head with face and labrum with symmetrical small black spots; occiput with some black markings separated by median line; behind antennae and eyes each a black band.

Pronotum (figs 35-36) of general colour; lateral lobe with lower margin widely yellow brown, remaining part of lateral lobe with scattered blackish brown dots, more solid black in hind part; dorsum with prozona often with inconspicous dark brown markings but in a few specimens ranging to a narrow median black stripe divided by a yellowish median line, metazona of general colour or in some specimens with green flush; fore, lower and hind margins dark brown, on upper side blackish brown.

Elytron from dark to blackish brown, the area of Sc, R and M paler or even yellowish. Dorsum of first abdominal tergite, commonly covered by the elytra, black or dark brown. Last abdominal tergite completely and upper part of lateral side of subgenital plate black. Cercus blackish brown, particularly basally, including basal tooth. Legs with black pattern as in type species.

Female. Seventh abdominal sternite with a small protuberance in the middle of the posterior part. Subgenital plate (figs 21-22) as wide as long, ventral and lateral surfaces somewhat flattened, hind margin with a wide median excision of almost semicircular shape, apices of the lobes obtuse and slightly curled inwardly. Lateral sclerites without particulars. Ovipositor as in type species. Coloration as in male, subgenital plate with blackish flush along upper lateral margin.

Measurements (in mm): body ♂♂ 27.0-30.5, ♀♀ 27.0-29.0; pronotum ♂♂ 11.5-13.0, ♀♀ 11.8-12.5; hind femur ♂♂ 23.0-26.0, ♀♀ 25.0-29.0; ovipositor 20.3-25.2

BIOACOUSTICS. No record available.

HABITAT. Shrubby areas as usual.

DISTRIBUTION. Known only from the Ionian Island of Kefallinia (fig. 41).

ETYMOLOGY. Named after its occurrence in Kefallinia (in Greek) = Cephalonia (in Latin).

DISCUSSION. From morphological characters and distribution it is clear that *E. epirotica* and *E. cephalonica* are sister species. Reliable and consistent features to separate both species are the male titillator and cercus, the female subgenital plate and in both sexes the coloration of the pronotum. The fused part of the titillator in the new species tapers more abruptly near the base while in *E. epirotica* this part tapers over most of its length and looks thus more slender and elongate. The basal tooth of the male cercus in the new species is less thickset, slightly narrower and thus more slender than in *E. epirotica*. The median incision of the female subgenital plate in the new species is distinctly wider and more shallow than in *E. epirotica* but more conspicuously different are the tips of the apical lobes of the female subgenital plate which are simply obtusely angled in *E. epirotica* but peculiarly curved inward in the new species. The difference between *E. cephalonica* and *E. epirotica* in coloration of the backside of the pronotal prozona is commonly obvious but may approach each other exceptionally (figs 33-36). Distinction with other members of the genus offers no special problems.

The Ionian Islands are biogeographically interesting by their endemics of *E. leucasi* and *E. cephalonica* as well as by the transjonian distribution of *E. chabrieri garganica* in the Gargano area of Italy (Willemse 1980; Massa 1999). Like *E. epirotica* and *E. cephalonica* are sister species, the same is true for *E. chabrieri garganica* and *E. leucasi*. For convenience of the reader a distribution map (fig. 41) is given recording all taxa of the genus known from the Ionian Islands from Kerkira to Zakinthos and the opposite part of continental Greece. The localities are updated and based on the very few reliable records in the past and mainly on recently studied material (see legend of fig. 41). The distinction between *garganica* and *schmidti* in their zone of contact is arbitrary, an argument to consider these taxa subspecies of the *E. chabrieri* complex.

ACKNOWLEDGEMENTS

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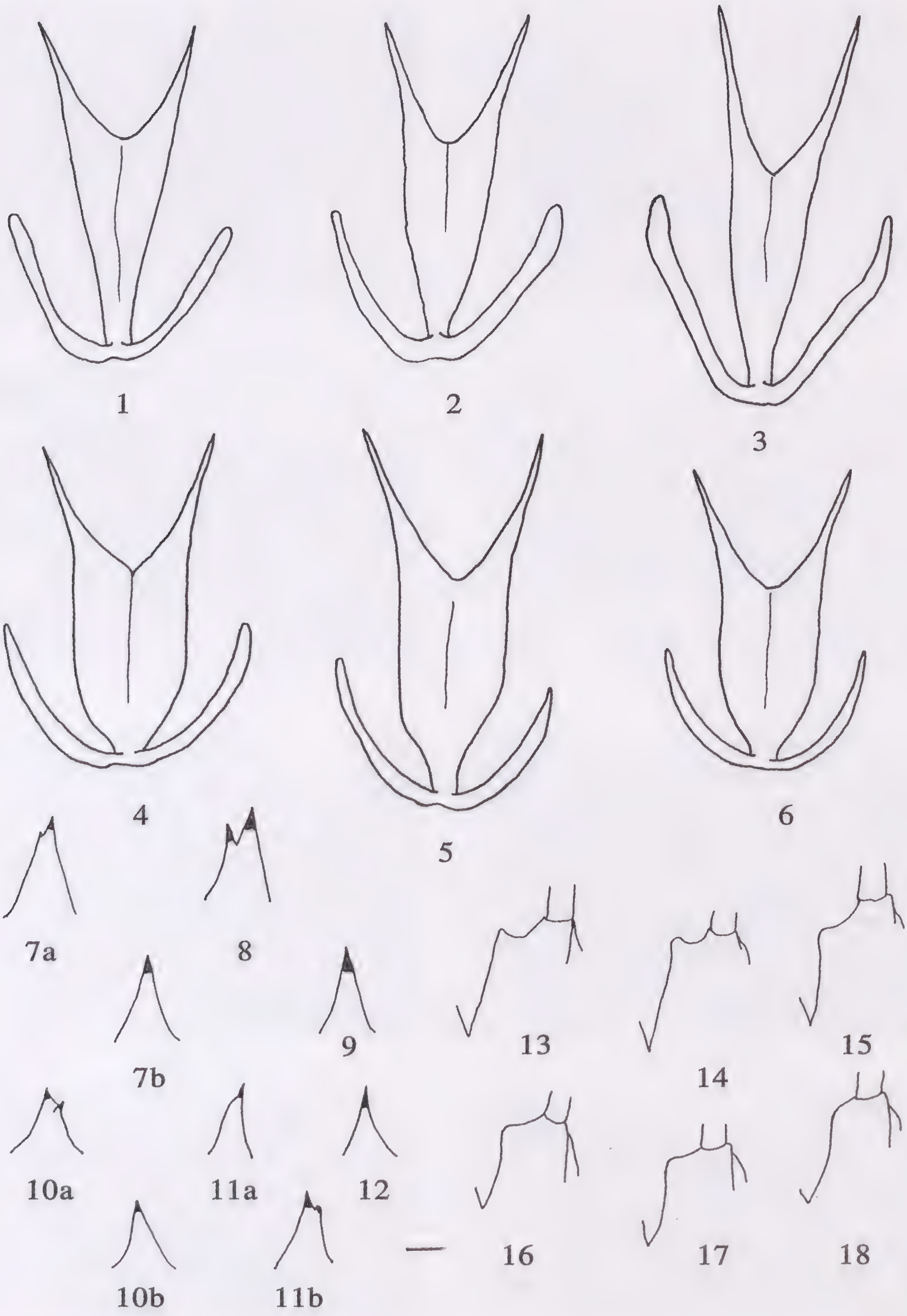
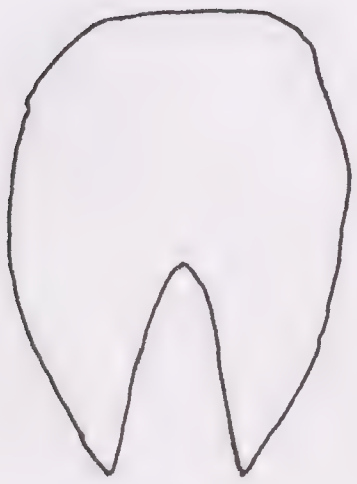


Figs 1-18. *Eupholidoptera* species, male. 1-3 - titillator in *E. epritotica* (1 from Babini, 2 from Mitikas, 3 from Loutrakion); 4-6 - same in *E. cephalonica* (4 from Dhavgata, 5 from plateau Mt Ainos, 6 from Limni Avigon); 7-9 - apical armature of lobes of subgenital plate in *E. epirotica* (7a-7b left and right lobe, from Mt Akarnanika, 8-9 from Thirion); 10-12 - same in *E. cephalonica* (10a-b right and left lobe, from Sami, 11a-b, right and left lobe, from Dhavgata, 12 from Limni Avigon); 13-15 - inner margin of right lobe of subgenital plate between base of stylus and deepest point of median incision, showing more or less developed median protuberance, in *E. epirotica* (13 from Aktion, 14-15 from Drimon); 16-18 - same in *E. cephalonica* (16 from Limni Avigon, 17-18 from plateau Mt Ainos). Scale = 1 mm in figs 1-6 and 13-18, 0.5 mm in figs 7-12.



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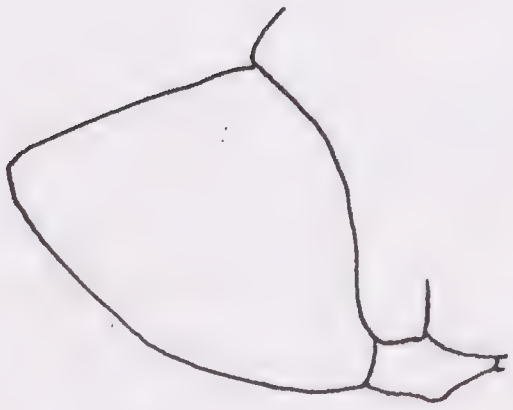

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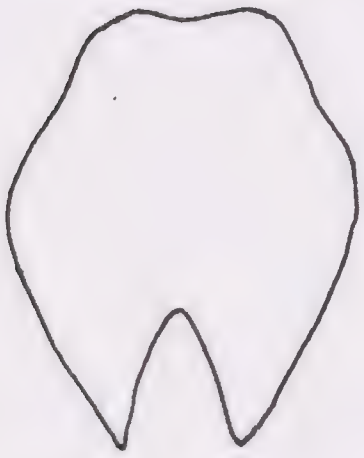

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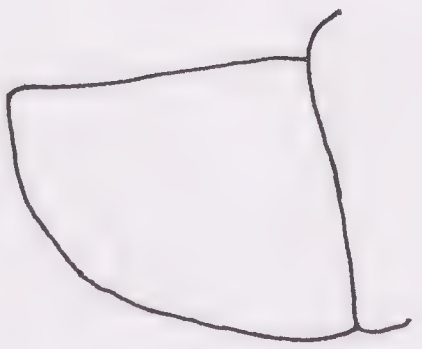

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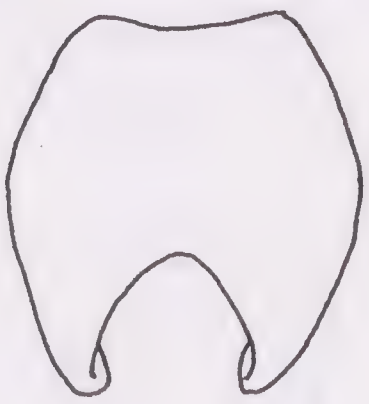

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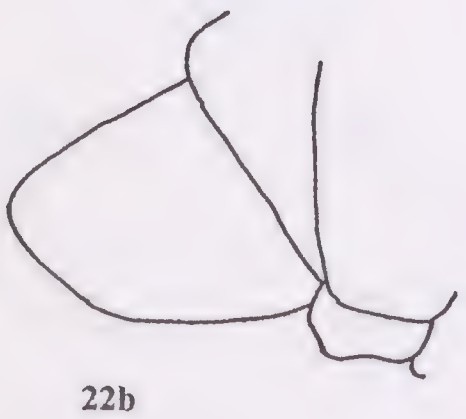

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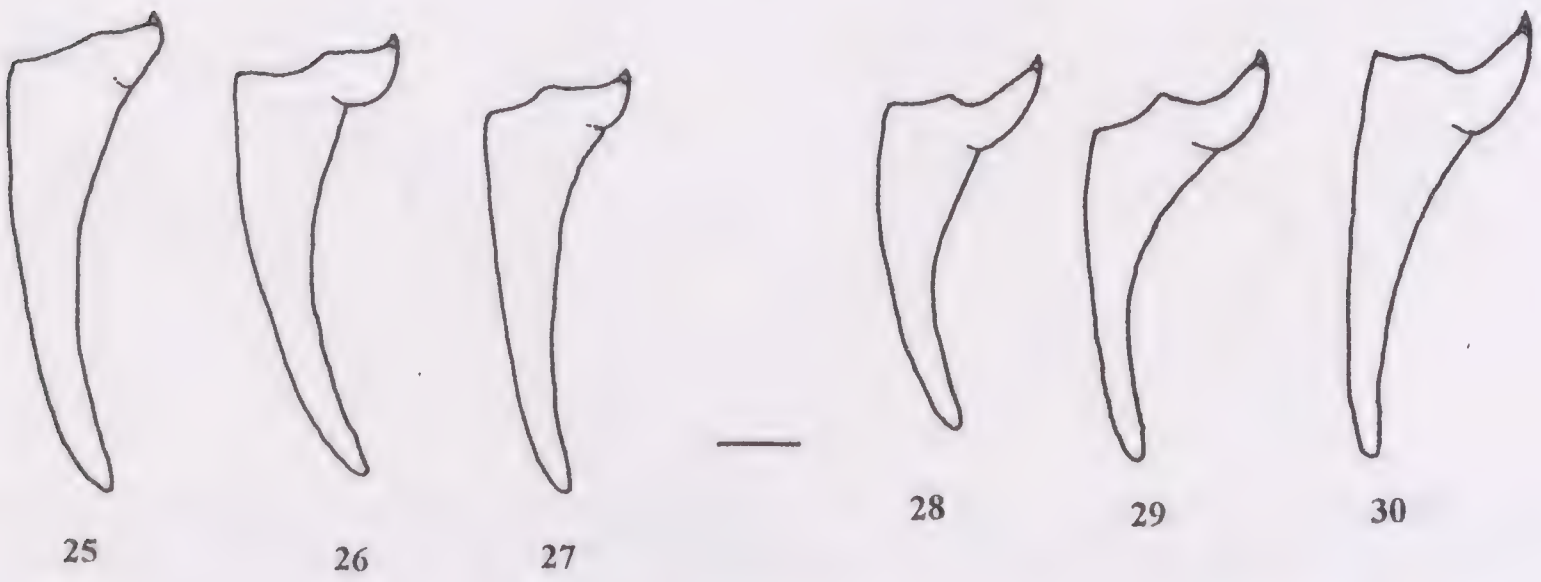

25 26 27 28 29 30

Figs 19-30. *Eupholidoptera* species. 19-20 - female subgenital plate in ventral (a) and lateral (b) view of *E. epirotica* (20 from Drimon, 21 from Thirion); 21-22 - same in *E. cephalonica* (21 from Neokhorion, 22 from Dhavgata); 23-24 - male last abdominal tergite in dorsal view in *E. cephalonica* (23 from Sami, 24 from plateau Mt Ainos); 25-27 - left male cercus in dorsal view in *E. epirotica* (25 from Mitikas, 26 from Aktion, 27 from Babini); 28-30 - same in *E. cephalonica* (28-29 from plateau Mt Ainos, 30 from Limni Avigon). Scale = 1 mm.

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Figs 31-38. *Eupholidoptera* species, pronotum in dorso-lateral view, showing minimum to maximum degree of black coloration: 31-32 - *E. megastyla*, aberrant color form from Sklavaina; 33-34 - *E. epirotica* from Loutrakion; 35-36 - *E. cephalonica* paratypes from Dhavgata; 37 - *E. megastyla* topotypical form from A. Nikolaos, Zakinthos; 38 - *E. megastyla* forma *willemsei* topotype from Achladokambos.

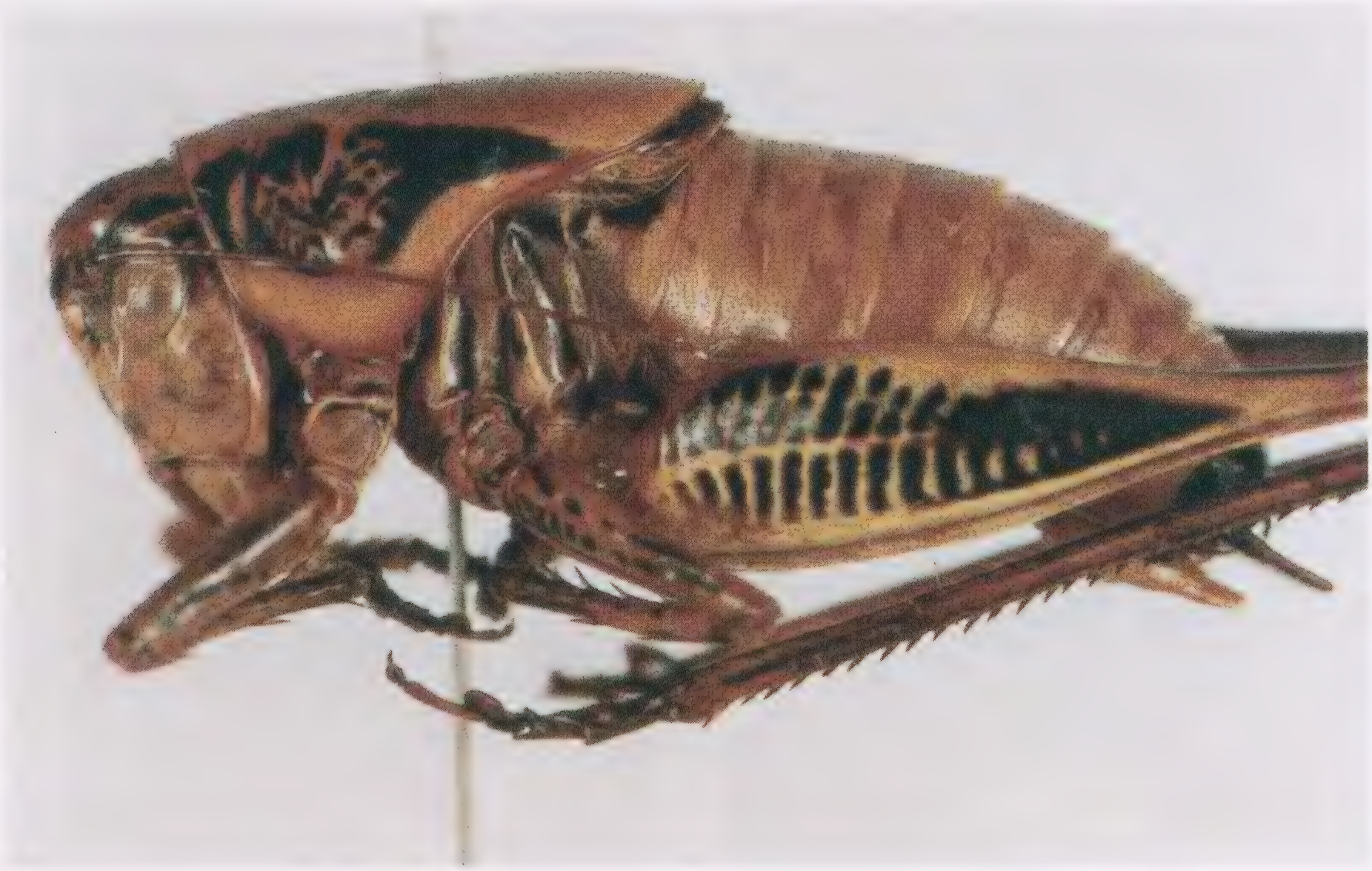

Fig. 39. *Eupholidoptera cephalonica* n. sp., holotype.

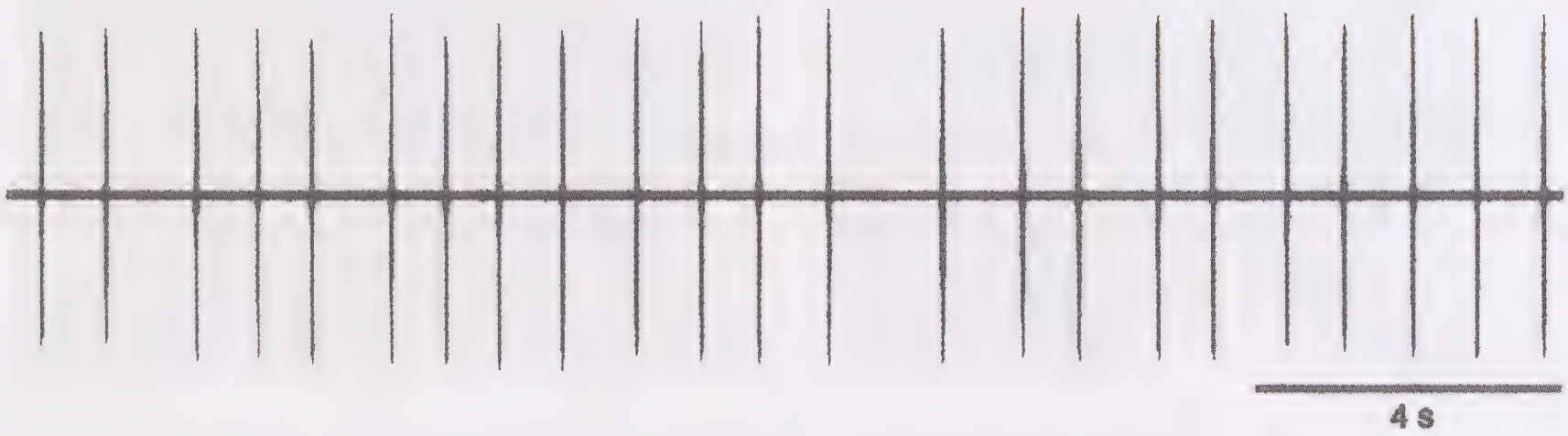

Fig. 40. *Eupholidoptera epirotica*, oscillogram of male calling song, collected 27.VII.1987 in Mt Akarnanika above Thirion; record of isolated specimen, in cage, 30.VII.1987, air temp. 27° C, 22.00 local time, almost dark.

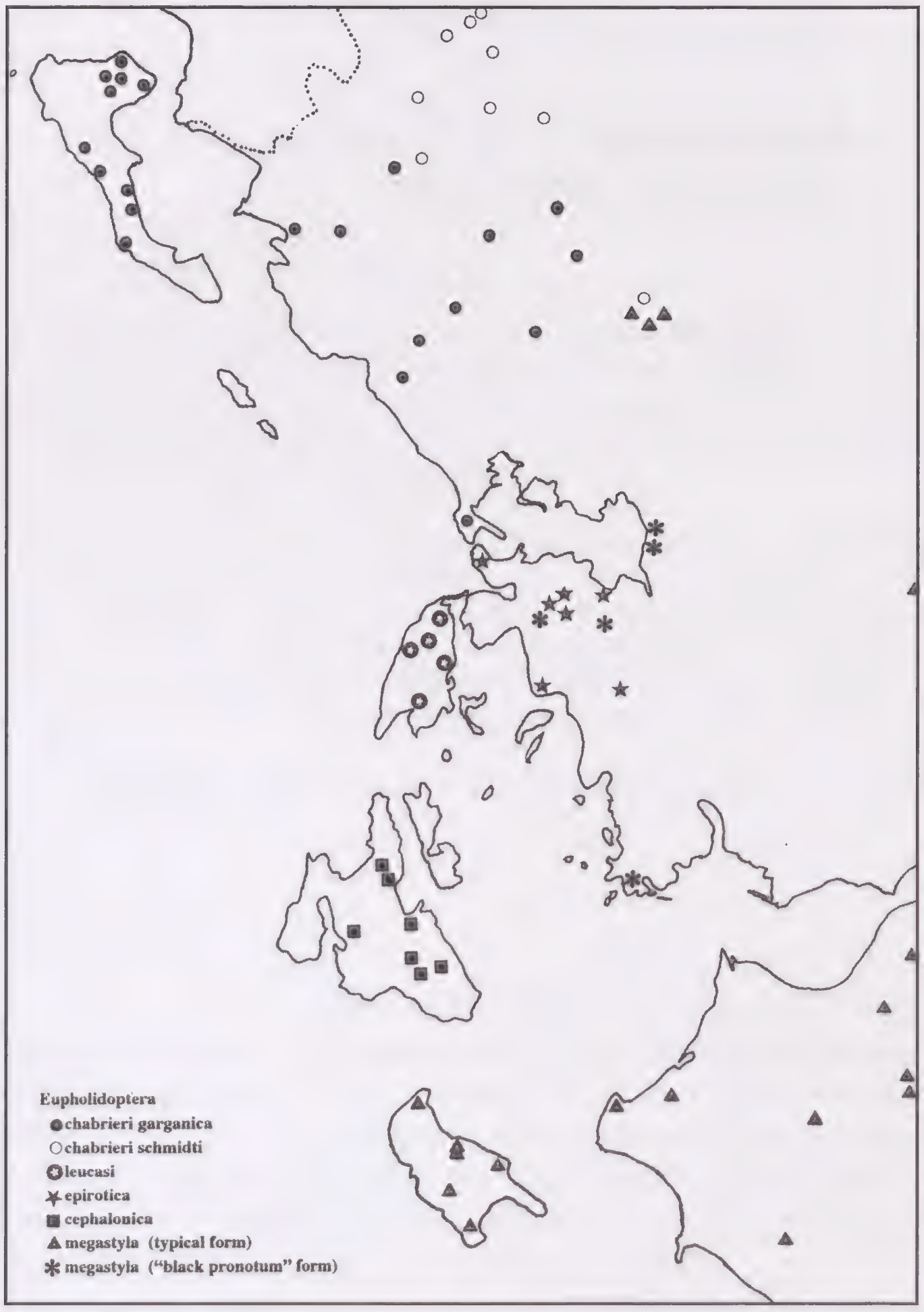

Fig. 41. Distribution map of *Eupholidoptera* species of the Ionian Is. and opposite continental Greece from few data in Ramme (1939) and Kaltenbach (1967), and many data from material in coll. Willemse, J. Tilmans and Kl.-G. Heller.

Localities summarized: *E. chabrieri garganica*: Kerkira (Perithea 500 m; Gimarion 50 m; Gazatika 20 m; Limni Antinoti; Tsaki 100 m; Limni Korission; Petalia 500 m; Pelekas 100 m; Lafkion 100 m; Bentizes); Thesprotia (Igoumenitsa; Gliki; 2 km W of Karitiani near Thiamis river; Mt Soulion); Preveza (Panaiyia; Koroni; Nikopolis); Ioannina (Mt Tomaros; Dodoni; Vrosina; Kalentzi 8 km N; Koutseli, S. of Ioannina). *E. chabrieri schmidti*: Ioannina (Botzaras, Ieromnimi, S of Kouklii, Asfaka, Kalpakion; Aristi; Papigon; Vitsa; Mt Mitsikeli); Arta (Katarraktis, Mt Tzoumerka). *E. leucasi*: Lefkas (Ano Exanthia; Nikiana (N of Nidhrion); Lefkas town (coll. K.-G. Heller); Episkopos, 4.5 km W. Spanokhori, 4 km NE Vasiliki (all coll. J. Tilmans). *E. epirotica*: Aitolia/Akarnania (Loutrakion; Babini; Aktion; Mitikas; Monastirakion; Thirion; Mt Akarnanika). *E. cephalonica*: Kefallinia (Mt Ainos plateau W of Tsarkamanas; Mt Ainos 1000-1300 m; Limni Avikon near A. Nikolaos; 3 km S Sami; Patriata; Neokhorion; Dhavgata, 7 km N of Argostolion). *E. megastyla* typical form: Zakinthos (Zakinthos town, type; Limni Keriou; Alikanas; A. Nikolaos; cape Skinari; Kato Gerakari); Ilia (Killini town; Lechena; Platanos-Pelopion near Pirgos); Akhaia (Portes-Kharavyi, Mt Skollis; Mt Panakhaikon, Zastova-Psarthri; Mt Erimanthos, Kalentzi and A. Pandon-Alepokhorion; Khalandritsa); Evritania (Timfristos); Arta (Ramia-Livadion; Mt Tzoumerka W and SW of Theodhoriana). *E. megastyla* aberrant colour form with black occiput and wide black median pattern of the backside of the pronotal prozona: Aitolia/Akarnania (Koutsiliaris hill, Acheloos Delta; Sklavaina; Trifos (coll. K.-G. Heller); Loutron (coll. J. Tilmans); Anixiatikon-Katafourka).

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A new species of the Genus *Rhacocleis* from Libya (Orthoptera Tettigoniidae)

Abstract - *Rhacocleis lagrecai* **n. sp.** is described from Cyrenaica region (Libya), on specimens collected in the localities of Tocra (= Tokrah = Araquiriyah) and El Kouf, near Kufantah and El Karsa villages. The main morphological features are male cerci, with a median inner tooth, and titillators, with flattened and expanded apex. Both sexes present hind legs plantulae a bit longer than first tarsal segment.

Riassunto - *Una nuova specie del genere* Rhacocleis *della Libia (Orthoptera Tettigoniidae).* Viene descritta *Rhacocleis lagrecai* **n. sp.** della Cirenaica, in Libia, presso Tocra (= Tokrah = Araquiriyah) e ad El Kouf, tra i villaggi di Kufantah e di El Karsa. Le principali caratteristiche morfologiche sono la forma dei cerci del maschio, muniti di un dente interno posto in posizione mediana, e dei titillatori, ad apice appiattito e leggermente dilatato. Entrambi i sessi evidenziano zampe posteriori con plantule leggermente più lunghe del primo tarsomero.

Key words: Tettigoniidae, *Rhacocleis lagrecai* n. sp., taxonomy, affinities.

INTRODUCTION

The genus *Rhacocleis* Fieber, 1853 till now numbers 46 species, distributed around Mediterranean sea, from Morocco to Turkey (Galvagni & Fontana 2000; Galvagni 2001). In North Africa the genus is widespread in the western regions (Galvagni 1984, 1988, 1989, 2001), while is scarcely represented in the eastern ones (Massa 1998). In Libya the genus *Rhacocleis* seems to be rare and Massa (1998) lists only *Rhacocleis dernensis* Salfi, 1926, pointing out also that another species, *R. bidens* Uvarov, 1924, has been described from the Egyptian border with Libya.

Among unidentified specimens collected in Libya preserved in the Natural History Museum of London one of us (P.F.) found a male specimen of *Rhacocleis* that cannot be assigned to any species described in this genus. We describe it here, naming in memory of Marcello La Greca, who carried out the revision of the Italian species (La Greca 1959) and investigated the biogeography of the genus *Rhacocleis* (La Greca 1996). After our description was completed and submitted for publication, we received further material of the same species, collected not far from the first locality by Renzo Ientile from Siracusa. One female also present in this material consents us to complete the description of this new species.

Rhacocleis lagrecai n. sp.

TYPE LOCALITY: Libya, Cyrenaica, Tocra (= Tokrah = Al Aquriyah).

EXAMINED MATERIAL: Libya, Cyrenaica, Tocra (= Tokrah = Al Aquiriyah), 2.X.1951, leg. I. A. D. Robertson, 1 male (*holotype*), NHM of London; Libya, Cyrenaica, El Kouf (near Kufantah and El Karsa villages), 2.IX.2003, leg. Renzo Ientile, 2 males and 1 female (*paratypes* and *allotype*), coll. P. Fontana and coll. B. Massa.

MALE (*holotype*). Medium size (tab. 1). General appearence (figs 1-2) similar to *R. dernensis*, as illustrated by Salfi (1926: fig. 50). Brown in colour, from light to dark brown, with black and white patterns on head, legs and pronotum (figs 1-4). Head dark brown from fastigium to occipital region, with a blackish stripe near the eyes (like a small mask), and the lower part whitish. A blackish elongated spot is also present in the posterior margin of head (fig. 3). Fastigium, in dorsal view, as large as the eye. Pronotum smooth, with disk and lateral sides dark brown to blackish, and a wide, irregular lower lateral withish band (figs 3-4). Tegmina short, rounded, brown coloured, with darker anterior and clearer posterior veins. Abdomen subcylindrical, brown, with a median dorsal keel, built up by a small keel present in the posterior part of each tergite, protruding backwards in a small blackish tooth (fig. 2). Fore and median femurs with withish apex and subapical blackish spot. Hind femurs long, with a longitudinal blackish band on the upper part of lateral sides (fig. 1) and a small blackish spot near the base of the upper side (fig. 2). Plantulae of hind tibiae a bit longer than the first tarsal segment (fig. 5). Tenth tergite with posterior margin largely and scarcely incised, delimited by two subtriangular expansions (fig. 6). Cerci, from dorsal view, gently curved inside, with a small acute blackish apex and a median stout inner tooth, which is subconical, with rounded apex, blackish in its apical half (figs 6 and 9). Cerci, from lateral view, slightly downcurved (fig. 8); observed from the inner view (fig. 10) they are clearly thicker in the basal half, before the insertion of the tooth. Subgenital plate subtriangular, with moderately long styli, median keel and lateral oblique longitudinal reliefs and rounded incised median margin (fig. 7). Titillators stout, rugose, s-shaped, seen from above and gently upcurved from lateral view; apex flattened and expanded (figs 11-12).

Tab. 1 - Main measures (in mm) of male *Rhacocleis lagrecai* n. sp.

Total length (from vertex to hind femur apex)	33-36
Pronotum length	6-6.7
Pronotum height	3.4-3.5
Tegmina length (visible portion)	1.6-1.8
Cerci length	1.5-1.8
Hind femur length	21-22.5
Hind femur maximum height	3.45-4.13
Titillators length	1.68-2.1

FEMALE (allotype). General appearance (figs 13-14) and colour pattern as male.

Medium size (tab. 2). Tegmina very short, almost completely covered by pronotum. Abdomen subcylindrical, with a median dorsal keel, built up by a small keel present

in the posterior part of each tergite, protruding backwards in a small blackish tooth. Fore and median femurs with withish apex and subapical blackish spot. Hind femurs long, with a longitudinal blackish band on the upper part of lateral sides (fig. 13) and a confused small blackish spot near the base of the upper side (fig. 14). Plantulae of hind tibiae a bit longer than the first tarsal segment (fig. 17). Supraanal plate with posterior margin largely and scarcely incised, delimited by two short subtriangular expansions (fig. 18). Cerci subconical, from dorsal view, gently curved inside (fig. 18); from lateral view, slightly downcurved (fig. 20). Subgenital plate subelliptical, with a marked longitudinal medial keel and acute incised posterior margin (fig. 19). Ovipositor scarcely upcurved, 0.7 time as long as postfemora (fig. 13).

Tab. 2 - Main measures (in mm) of female *Rhacocleis lagrecai* n. sp.

Total length (from vertex to hind femur apex)	36
Pronotum length	7.5
Pronotum height	3.75
Hind femur length	22.5
Hind femur maximum height	3.75
Ovipositor length	15

DISTRIBUTION. This species is till now known only from Cyrenaica in Libya.

DERIVATIO NOMINIS. *Rhacocleis lagrecai* is named after the late nestor of Italian orthopterology, Marcello La Greca, to whom this article and the entire issue is dedicated.

AFFINITIES. The species is clearly related to *R. dernensis* Salfi, 1926, from which it is well distinct for the peculiar shape of male cerci (Salfi 1926) and female subgenital plate, as illustrated by Salfi (1927); the length of the plantulae consents also to find a certain affinity between *R. lagrecai* n. sp. and *R. bidens* Uvarov, 1924, described from Egypt, not far from eastern Libyan border (Uvarov 1924). The presence of related different species in a restricted area of the Cyrenaica region (fig. 21) suggests that the female assigned to *R. dernensis* by Salfi (1927), collected at Cirene, could belong to another undescribed taxon. Only further researches in Libya will consent to investigate the current distributional and taxonomical status of genus *Rhacocleis*.

AKNOWLEDGEMENTS

We are glad to thank Judith Marschall (NHM of London) for her kind help in our researches and Renzo Ientile (Siracusa) for providing newly collected material, very useful for the description of the new species.

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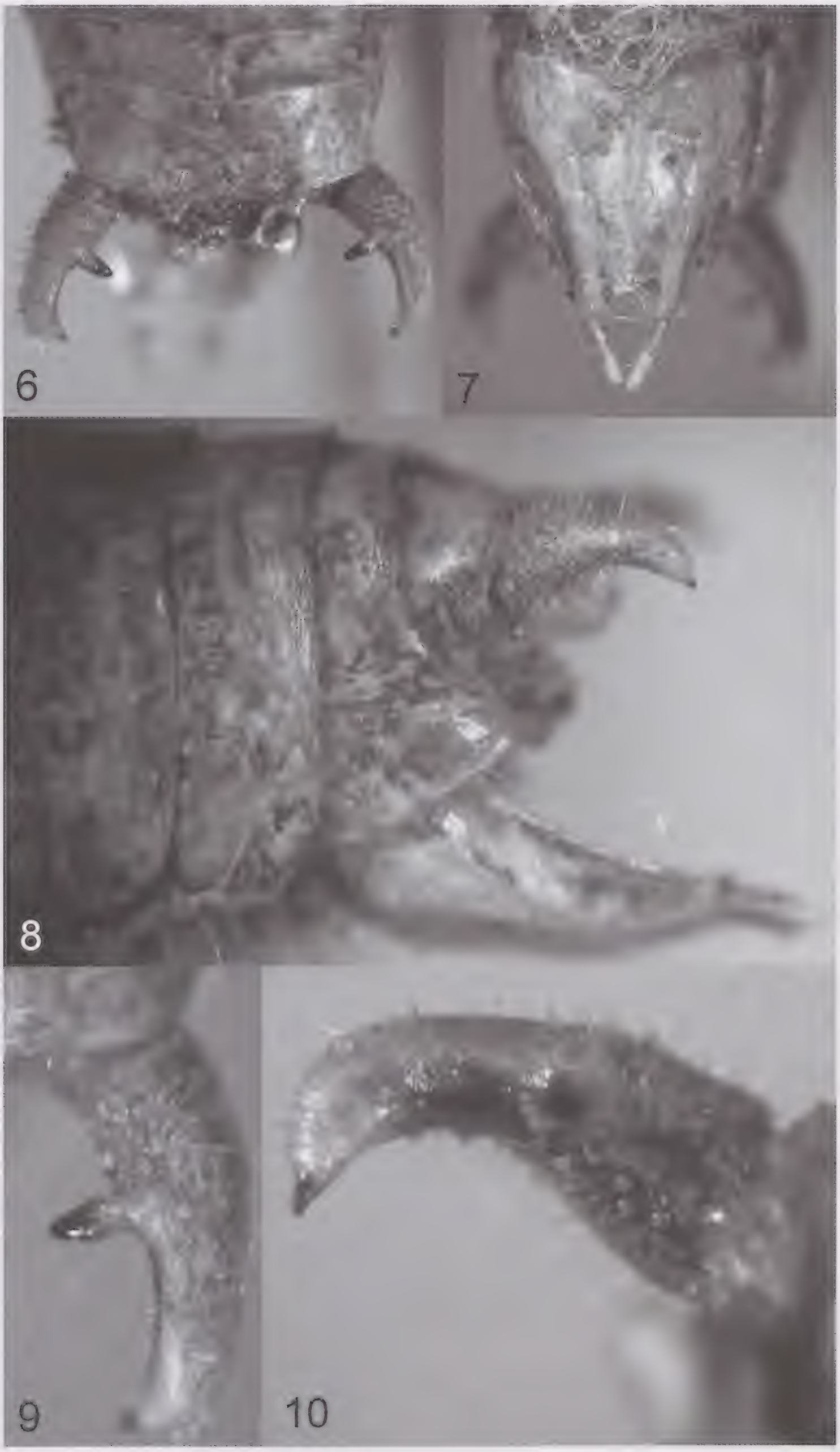
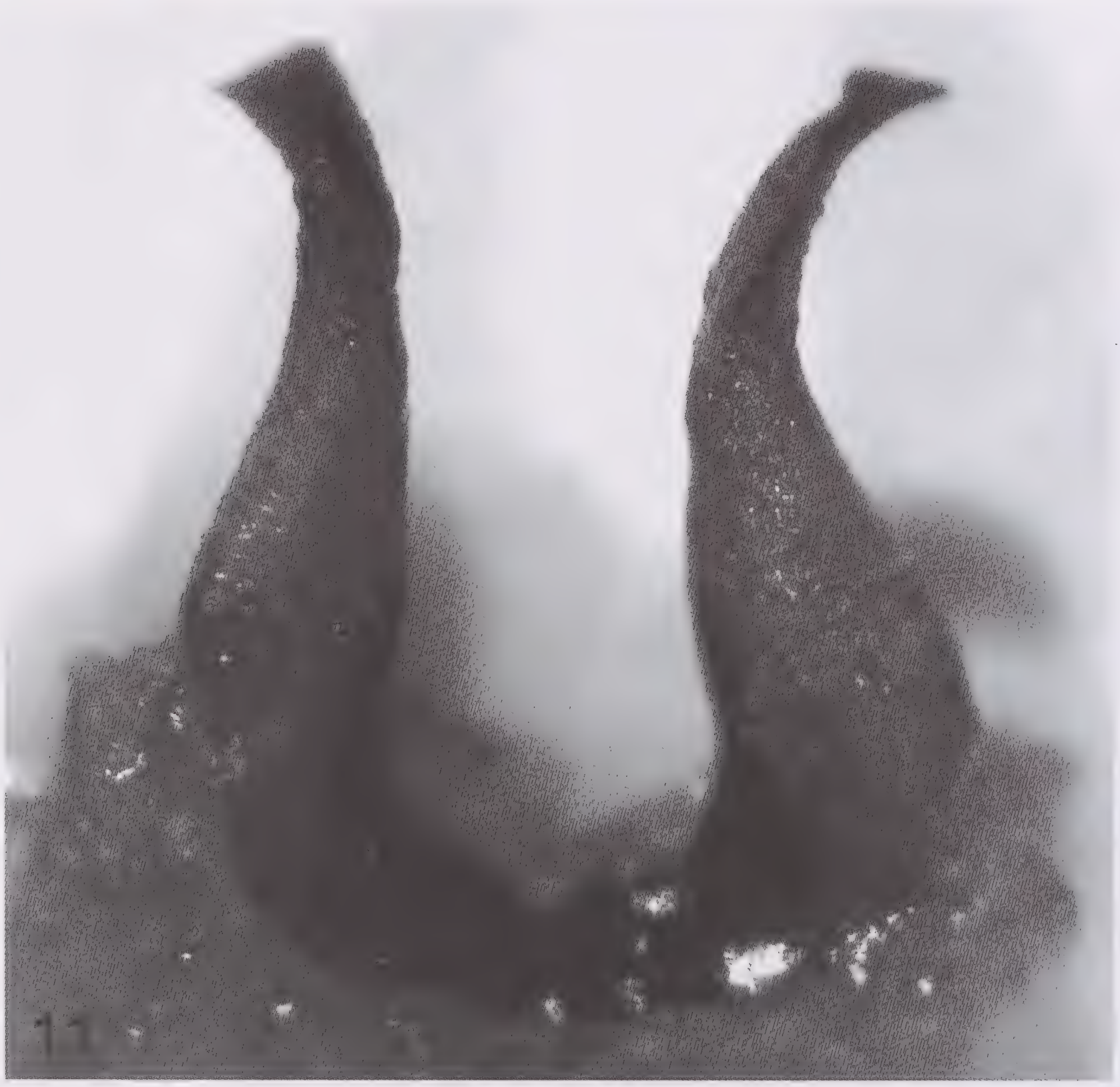
Figs 1-2. *Rhacocleis lagrecai* n. sp., male *holotype*: 1 - lateral view, 2 - dorsal view (Photos by P. Fontana).

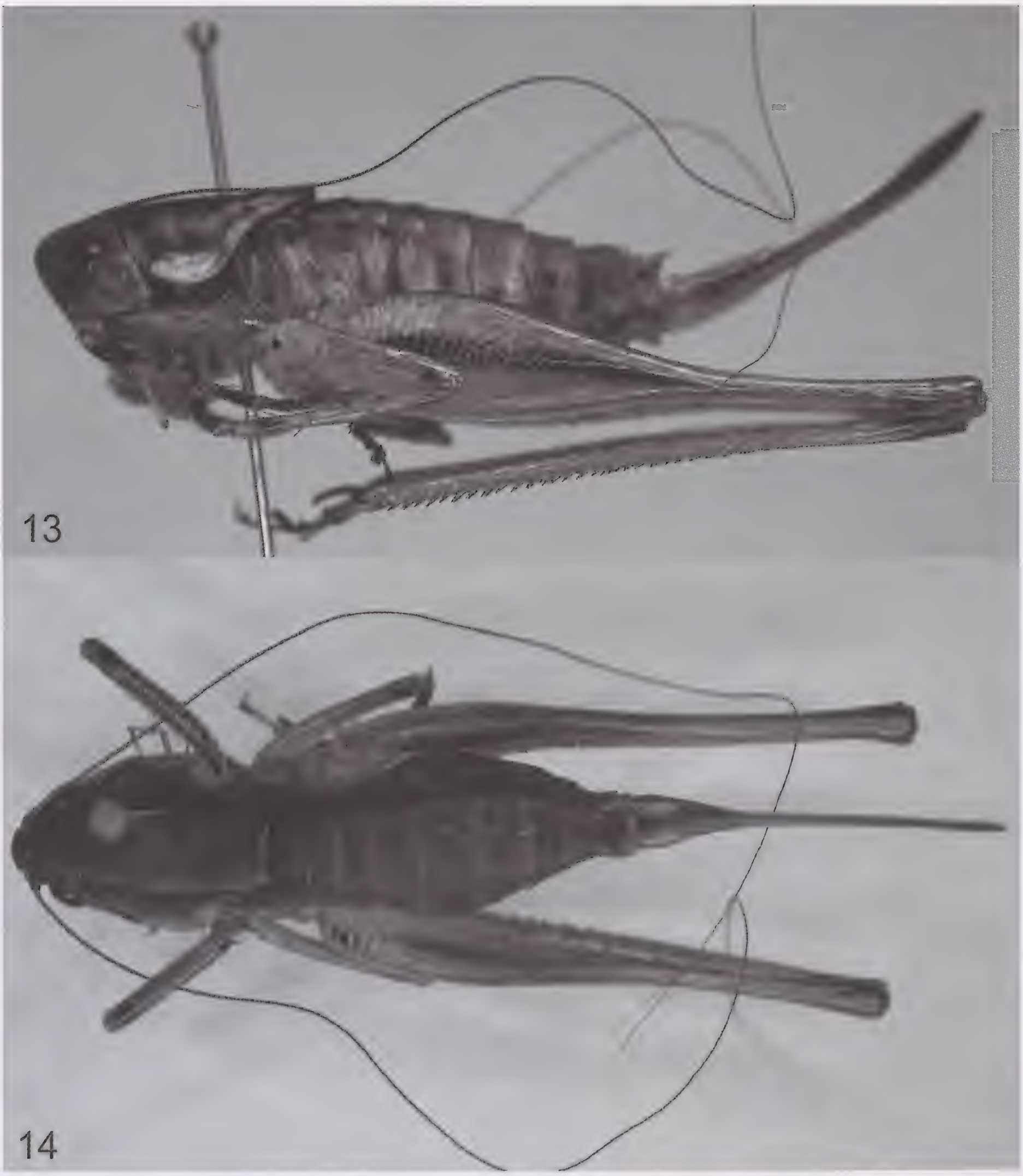
Figs 3-5. *Rhacocleis lagrecai* n. sp., male *holotype*: 1-2 - head and pronotum from lateral and dorsal view; 3 - plantulae and first tarsal segment of hind legs (Photos by P. Fontana).



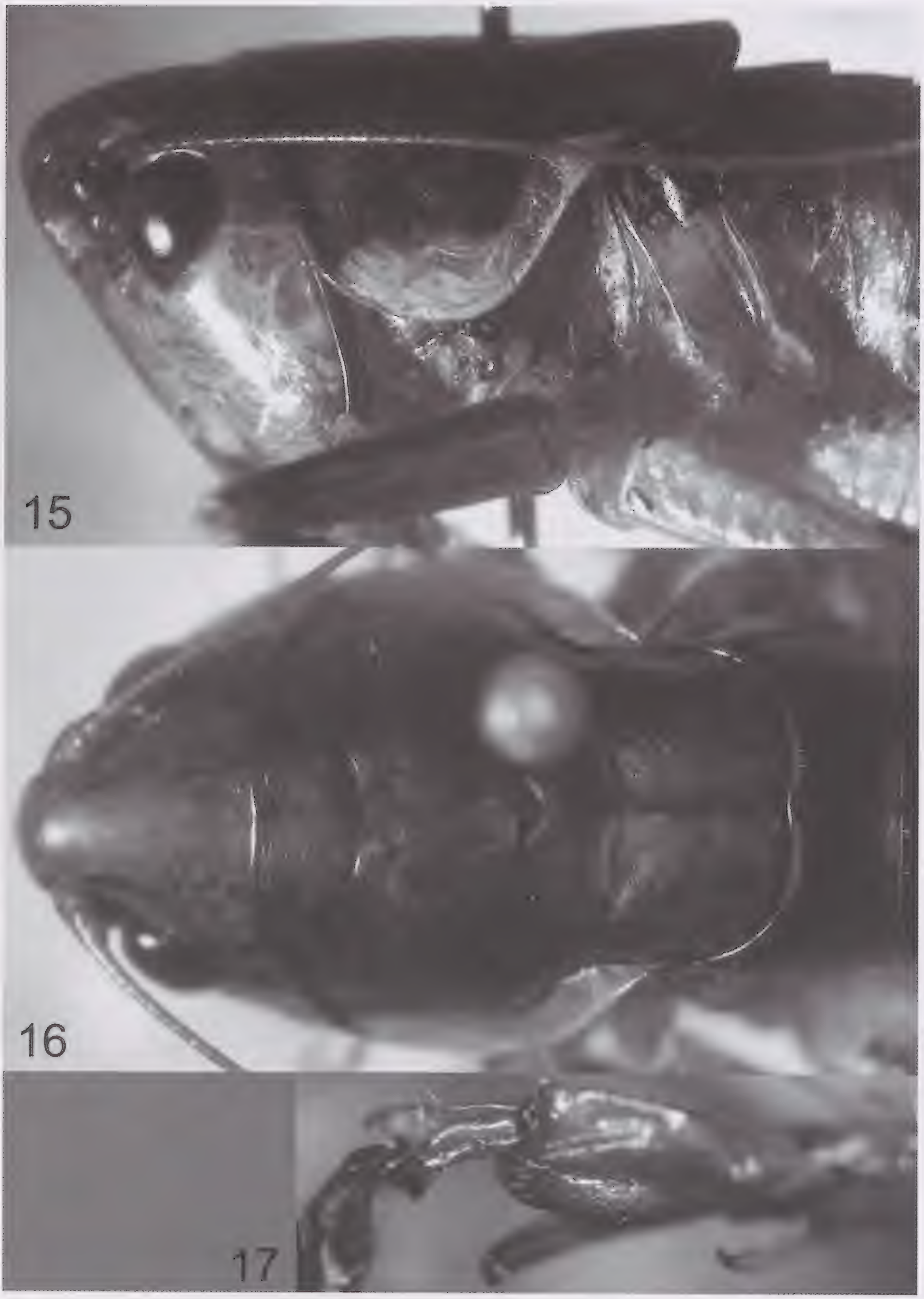
Figs 6-10. *Rhacocleis lagrecai* n. sp., male *holotype*: 6 - cerci and supragenital plate; 7 - subgenital plate; 8 - abdomen apex from lateral view; 9 - left cercus seen from above; 10 - right cercus from inner view (Photos by P. Fontana).



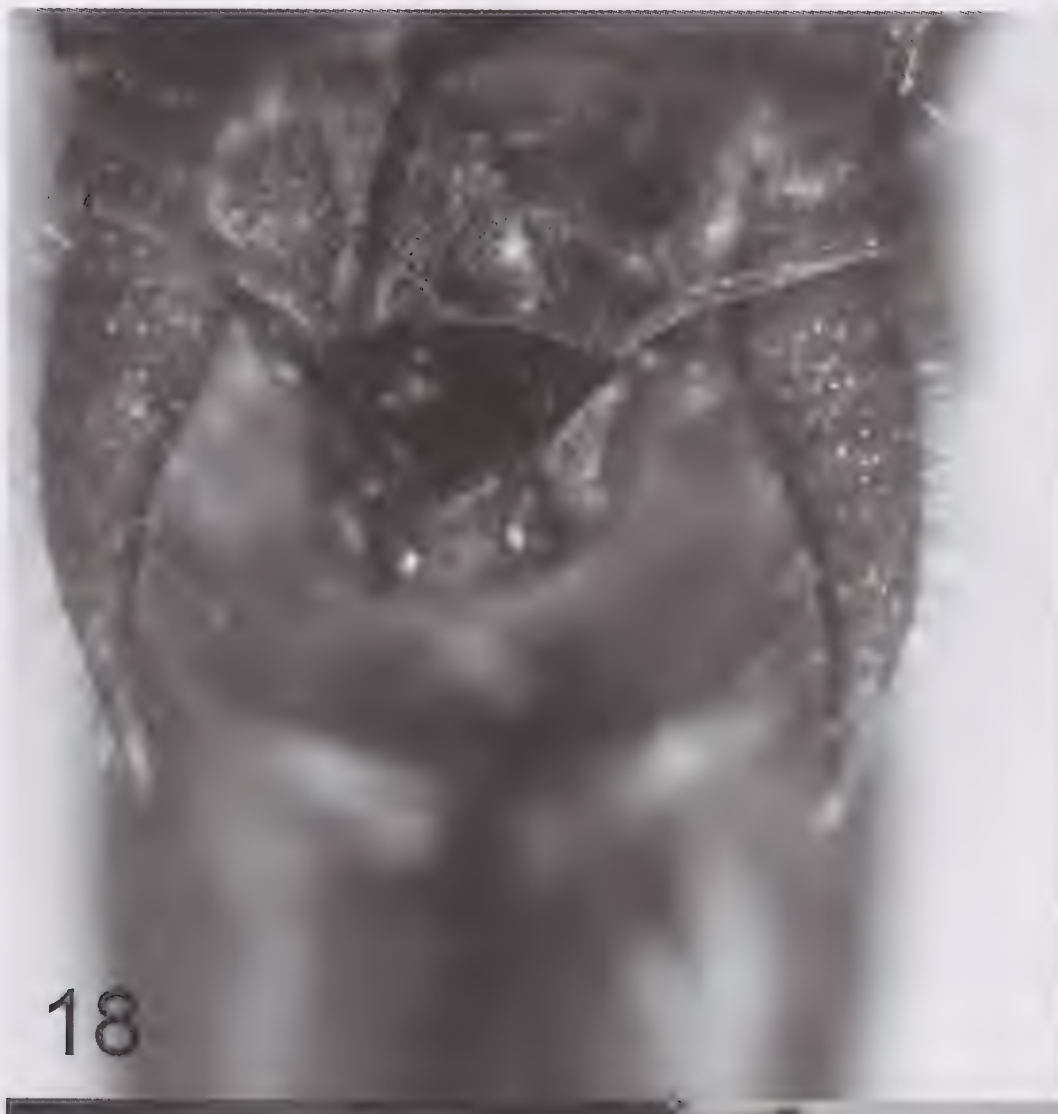
Figs 11-12. *Rhacocleis lagrecai* n. sp., male titillators: 11 - from above; 12 - lateral view (Photos by P. Fontana).



Figs 13-14. *Rhacocleis lagrecai* n. sp., female: 13 - lateral view; 14 - dorsal view (Photos by P. Fontana).



Figs 15-17. *Rhacocleis lagrecai* n. sp., female: 15 - head and pronotum from lateral view; 16 - idem, dorsal view; 17 - plantulae of right hind leg (Photos by P. Fontana).



Figs 18-20. *Rhacocleis lagrecai* n. sp., female: 18 - cerci and supraanal plate; 19 - subgenital plate; 20 - lateral vision of subgenital plate and ovipositor base (Photos by P. Fontana).

Fig. 21. Known distribution map of *Rhacocleis lagrecai* n. sp. (1-2), *R. dernensis* Salfi, 1926 (3-4) and *R. bidens* Uvarov, 1924 (5).

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Antonio GALVAGNI

Sui Tipi di *Anonconotus apenninigenus* e sulla terra tipica della specie (Orthoptera Tettigoniidae)

Riassunto - L'Holotypus (femmina adulta) e l'Allotypus (maschio subadulto) di *Anonconotus apenninigenus* (Targioni Tozzetti, 1881), provenienti dall'Appennino Toscano (Italia centrale) e unici esemplari finora noti di questa specie, vengono ridescritti e illustrati con disegni originali. Si distinguono dalle popolazioni di *Anonconotus sibyllinus* Galvagni, 2002 dei Monti Sibillini (Appennino Umbro-Marchigiano) in particolare per la struttura dei cerci del maschio e della lamina sottogenitale della femmina. Per il momento non è possibile il confronto dei titillatori dei maschi non essendo disponibili quelli di *A. apenninigenus* (un solo maschio subadulto noto). La struttura dei cerci di quest'ultimo si avvicina maggiormente a quella dei cerci di maschi di A. *ligustinus* Galvagni, 2002 delle Alpi Liguri occidentali. Viene segnalato che la ridescrizione di *A. apenninigenus*, effettuata da Carron et al., 2002 su esemplari provenienti dai Monti Sibillini e dai Monti Reatini, deve invece riferirsi ad *A. sibyllinus* Galvagni, 2002, la sola specie presente in quest'area appenninica in base alle attuali conoscenze.

Abstract - *On the types of* Anonconotus apenninigenus *and on the locus typicus of this species (Orthoptera Tettigoniidae).*
The Holotype, adult female, and the Allotype, subadult male, of *Anonconotus apenninigenus* (Targioni Tozzetti, 1881), the only currently known specimens of this species found in the Tuscan Apennine (Central Italy), are re-described and illustrated. They are distinguished from specimens of *Anonconotus* from Sibillini Mts (Umbria-Marches Apennines), recently described as *Anonconotus sibyllinus* Galvagni, 2002, for the male cerci and the female subgenital plate structure. It was not possible to compare titillators, being not available those of the subadult male Allotype of *A. apenninigenus*. The male cerci structure in this species is similar to the one of *A. ligustinus* Galvagni, 2002, a species from the Western Ligurian Alps.
Moreover, the redescription of *A. apenninigenus* made by Carron et al., 2002 has to be referred to *A. sibyllinus* Galvagni, 2002, as it was based on material collected on the Sibillini and Reatini Mts, where only this last species is known.

Key words: Orthoptera, Tettigoniidae, *Anonconotus apenninigenus*, type re-description, Tuscany, Italy.

Dedico questa nota alla memoria del compianto Professor Marcello La Greca di Catania, uno dei massimi naturalisti italiani del nostro tempo, al quale si devono anche fondamentali studi sistematici e zoogeografici sull'ortotterofauna d'Italia.

INTRODUZIONE

Presupposto fondamentale per intraprendere uno studio approfondito sulle specie del genere *Anonconotus* Camerano, 1878, è la conoscenza di materiale tipico di *Anonconotus alpinus* (Yersin, 1858) e di *Anonconotus apenninigenus* (Targioni Tozzetti, 1881).

Per la prima specie, descritta delle Alpi svizzere vicine al villaggio di Morcles nel Cantone del Vaud, non è cosa difficile disporre di topotipi, in quanto essa è abbastanza comune in quei luoghi, ad altitudini che si aggirano sui 2000 metri s.l.m.; non è così per la seconda entità, descritta da Targioni Tozzetti nel lontano 1881, sulla base di una femmina adulta e di un maschio subadulto, che l'Autore scrive provenienti dall'Appennino presso Firenze ("In subapenninis prope Florentiam reperta") e che nessuno ha mai più raccolto in quella regione[1].

Risultano, di conseguenza, di grande interesse questi due unici esemplari della specie, conservati presso il Museo Zoologico de "La Specola" dell'Università degli Studi di Firenze.

Io li ho avuti cortesemente in esame per lo studio che ho in corso di ultimazione sulle popolazioni italiane di *Anonconotus* che vivono sulle Alpi e sugli Appennini; ritengo pertanto opportuno illustrarli, mettendo in evidenza il loro stato e le loro caratteristiche morfologiche essenziali.

STATO DI CONSERVAZIONE

I *Typi* sono conservati in alcool e sono distinti da un'antica etichetta che li classifica come "*Omalota apenninigena*". Lungo il margine superiore dell'etichetta si legge "M 484 - Coll. 361-1866"; in basso, sotto il nome della specie, è scritto "St. Ilario" come luogo di ritrovamento ristretto; lungo il margine inferiore della medesima, è stampato a vecchi caratteri: "R. Museo di Fis. e St. nat. di Firenze". Su cartellini, molto più recenti, inseriti nel medesimo tubo di conservazione degli esemplari, si legge che la femmina è l'Holotypus della specie (distinto dal N. 0546) ed il maschio è l'Allotypus (distinto dal N. 0547).

Riproduzioni fotografiche dell'antica etichetta e dei due esemplari tipici si trovano nella recente pubblicazione di CARRON, SARDET & WERMEILLE (2002:897, figg. 9-11), che contiene i pregevoli risultati di una prima revisione del genere *Anonconotus* Camerano, 1878.

I due ortotteri, nonostante la loro secolare conservazione in alcool, hanno mantenuti intatti e ben visibili i principali caratteri esterni che li distinguono; solamente la femmina ha una parte dell'addome staccato dal resto del corpo ed i colori di entrambi gli esemplari si sono uniformati sul giallo ocraceo.

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[1] È assai dubbia la successiva indicazione della specie di Targioni Tozzetti (1898: 67) per Roccaforte (Firenze), trattandosi di altra entità, come ha fatto notare Baccetti (1954: 91).

La descrizione che segue è di complemento a quella originale, stesa in lingua latina, di Targioni Tozzetti (1881: 184, 185), che si riporta integralmente in calce pagina[2].

Descrizione complementare

Anonconotus apenninigenus (Targioni Tozzetti, 1881)

Omalota apenninigena Targioni Tozzetti, 1881, Bull. Soc. Ent. Ital., Firenze, 13:184.
Analota Apenninigena, Brunner von Wattenwyl, 1882, Prodr. europ. Orthopt., Leipzig: 317.
Anonconotus alpinus alpinus, Failla et al., 1995, (nec Yersin, 1858), Checklist delle specie della fauna italiana, N. 36 (1994), Calderini, Bologna: 9 (partim).
Anonconotus apenninigenus, Heller et al., 1998, Articulata, 7:31 (partim).
Anonconotus apenninigenus, Galvagni, 2002, Atti Acc. Rov. Agiati, Cl. Sci. mat. fis. nat., Rovereto, a. 252, S.VIII, 2 (B): 23, figg. 11, 12.

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[2] Descrizione originale di Targioni Tozzetti (1881: 184, 185) per *Anonconotus apenninigenus* (= *Omalota apenninigena*): Olivacea virens, oculi vittaeque postoculares fusco nigrescentes, in pronoti pleurae late triangulariter suffusae, antice tantum in foem. obliteratae, margine flavo. Abdominis vitta tergali duplici angusta, vittaeque duo pleurales fuscatae; femora in mare vitta infera, geniculisque fuscatis.
Ventricosa brevis; occipite convexo, vertice articuli antennarum basalis angustiore, late truncato. Pronotum lineare, subcompressum, antice subangustatum truncatum, postice rotundatum, lobo antico impresso punctato subrugoso, post marginem transverse sulcatum, medioque impressione lyraeformi suffultum; lobe postico, medio carinulato.
Abdominis segmenta medio carinata.
Squamae superanalis in mare lobulo trangulari obtuso; cerci cylindracei, lobuli longiores, apice sub-compressi trasverse truncati, angulo extimo acuto, interno hamulum atroviolaceum terminale, minutum referente. Sq. subgenitalis elliptico triangularis, basi truncata apiceque incisa, lobulis traingularibus obtusis carinatis, apice stylo breviusculo terminatis.
Squama superanalis in foem. lobulo trasverso subelliptico brevi, cercis conoideis incurvatis, vix longioribus; sq. subgenitalis semicircularis trasversa, margine postico incisa, lobisque brevibus obtusis.
Ovipositor basi subtetragono inflatum, demum adsurgens retiusculum, disco sub apice granulato, margine inermi.
Pedes crassi breves, antici brevissime pubescentes. Femora postica basi incrassata, ovipositoris basin tantum, vel abdominis estremitatem attingentia.
Tibiarum calcaria inferna longiora; plantulae spathulatae crassae, calcaria non excedentes.
Foem. long. Mill. 2,2 (per errore di stampa da rettificare in mm 22,00); Pronoti Mill. 5,5; Fem. ant. Mill. 4; Fem. post. Mill. 12; Ovipositor Mill. 15

FEMMINA ADULTA (Holotypus). Capo, visto dal dorso, con vertice leggermente convesso a lati solo debolmente concavi. (fig. 3).

Pronoto subcilindrico, poco più lungo della sua massima larghezza, con margine anteriore rientrante ad angolo ottuso e margine posteriore troncato (fig. 3).

Disco del pronoto subcompresso, cosparso di tacche rotondeggianti su tutta la sua estensione, lieve depressione centrale in corrispondenza del solco tipico che è a forma di U aperto; verso il terzo prossimale è presente un altro solco, ad angolo ottuso, che percorre trasversalmente tutto il disco e si estende alla porzione superiore dei lobi laterali; carena longitudinale mediana quasi nulla nella prozona, più evidente nella metazona subito dietro il solco tipico, in corrispondenza della lieve depressione centrale del disco. Questo ultimo si innesta ai lobi laterali, nel corso della metazona, in modo tondeggiante, senza dar luogo a carene laterali.

Lobi laterali del pronoto con tracce di una fascia longitudinale scura, più intensa ed evidente nella porzione della loro metà distale, la quale si prolunga in avanti, sul capo in corrispondenza degli occhi, e all'indietro, quantunque in modo discontinuo, fino a coprire tutto il primo urotergite (figg. 3, 4).

Tegmine molto piccole, laterali, a margine tondeggiante, che sporgono di poco dal pronoto,

Prosterno privo di spine.

Tibie delle zampe anteriori con una solo spina lungo il margine superiore esterno.

Decimo urotergite, visto da sopra, che sporge triangolarmente all'indietro, con vertice ampiamente arrotondato e pronunciata depressione longitudinale mediana.

Cerci conici, diritti se visti lateralmente, leggermente curvati verso l'interno nella parte apicale se osservati dal dorso; loro apice appuntito (fig. 5).

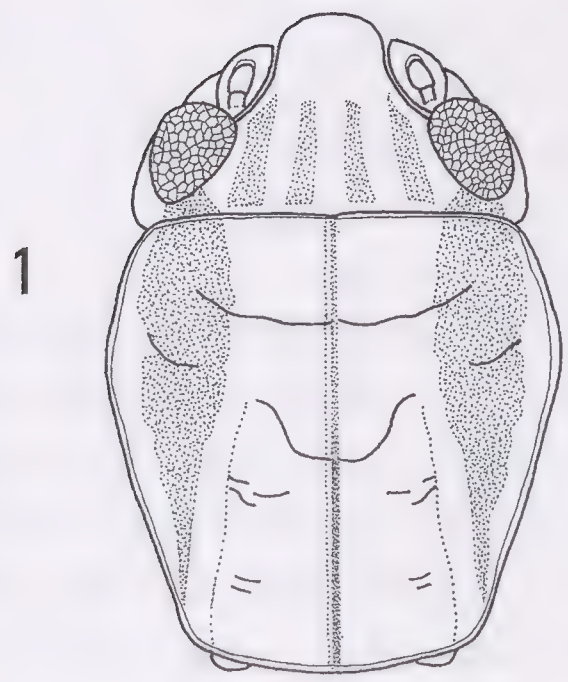
Ovopositore relativamente lungo, debolmente incurvato verso l'alto lungo la metà distale.

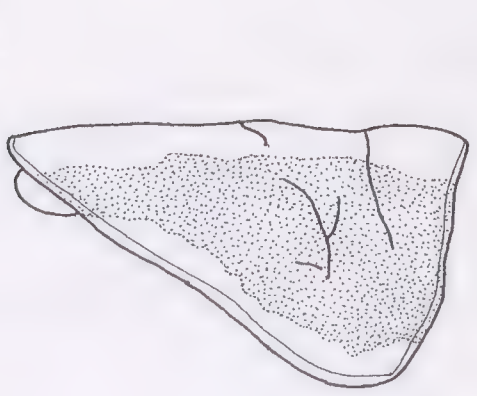
Lamina sottogenitale sviluppata trasversalmente, con una profonda insenatura mediana che separa due lobi laterali a margini tondeggianti (fig. 7).

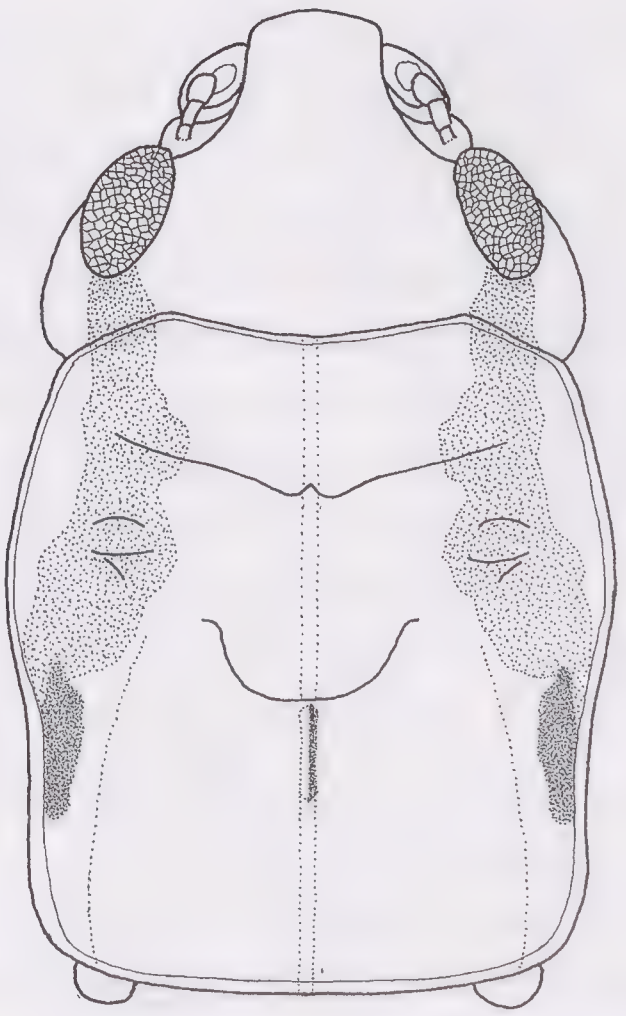
Nell'addome sono presenti delle uova di color bruno scuro.

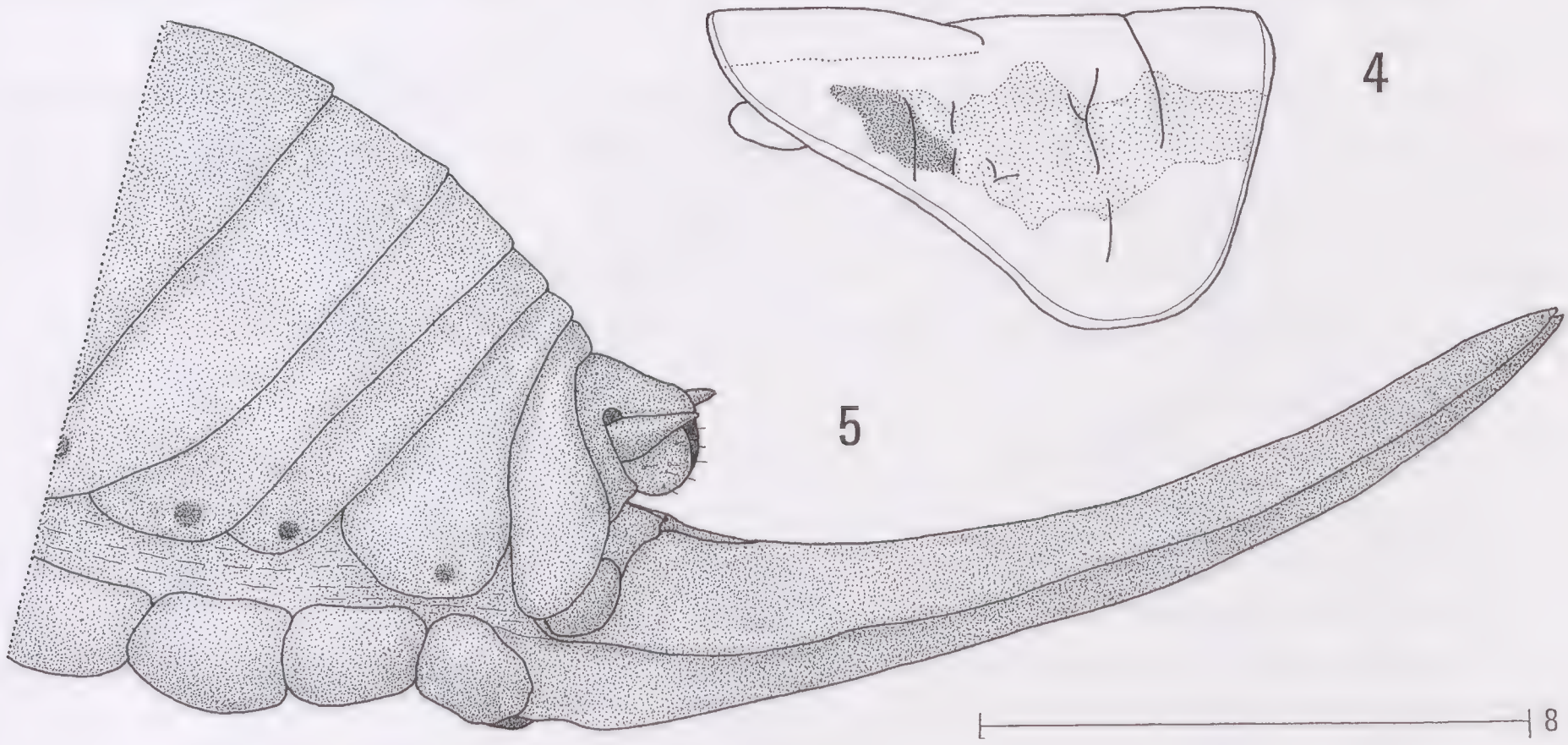
Le dimensioni della femmina (Holotypus) risultano le seguenti:

Lunghezza corpo	mm 22,00
Larghezza vertice del capo	mm 1,17
Lunghezza pronoto	mm 5,50
Larghezza massima pronoto	mm 5,17
Lunghezza tegmine visibili	mm 0,17
Lunghezza femori posteriori	mm 13,33
Lunghezza ovopositore	mm 14,67









Figg. 1-5. *Anonconotus apenninigenus* (Targioni Tozzetti, 1881), (Appennino presso Firenze: Consuma, St. Ilario): 1 - capo e pronoto in visione dorsale, maschio (Allotypus); 2 - idem, in visione laterale; 3 - capo e pronoto in visione dorsale, femmina (Holotypus); 4 - idem, in visione laterale; 5 - ovopositore in visione laterale, femmina, (Holotypus) Scale: 5 mm (1, 2, 3, 4), 8 mm (5). Disegni dell'autore.

MASCHIO SUBADULTO (Allotypus). Capo esaminato dorsalmente, con vertice a margine più convesso che nella femmina, a lati leggermente convergenti in avanti (fig. 1); occipite con tracce di quattro fasce longitudinali; porzione postoculare più scura.

Pronoto lungo poco più della sua massima larghezza situata a un terzo dal margine anteriore che è diritto; margine posteriore leggermente convesso.

Disco del pronoto convesso nella prima porzione della prozona, leggermente subcompresso nella metazona, con minutissime tacche tondeggianti e nessuna depressione centrale posteriore al solco tipico, che è a forma di U aperto; solco trasverso della prozona poco impresso, che si prolunga sui lobi laterali del pronoto. Carena longitudinale mediana poco rilevata ma visibile lungo tutto il suo corso, in ispecie nella metazona; congiunzione del disco ai lobi laterali tondeggiante. Lobi laterali di tinta più scura, salvo una fascia chiara che fiancheggia il loro bordo inferiore (fig. 2).

Tegmine molto piccole, laterali, a margine tondeggiante.

Prosterno senza spine.

Tibie delle zampe anteriori con una spina lungo il margine superiore esterno della zampa di destra e due spine lungo quello della zampa sinistra.

Femori posteriori con una larga fascia scusa lungo le facce esterna ed interna.

Regione pleura toracica con accenni di macchie scure.

Addome percorso, da ambo i lati, da una larga banda più scura rispetto alla tonalità di fondo.

Cerci, visti da sopra, quasi diritti; loro base poco più larga del resto del pezzo; margine esterno debolmente convesso (fig. 6) e quello interno con concavità accentuata prima di raggiungere la base di un grosso dente triangolare e appuntito diretto verso l'interno. Apice dei cerci arrotondato, munito di una piccola sporgenza conica e smussata.

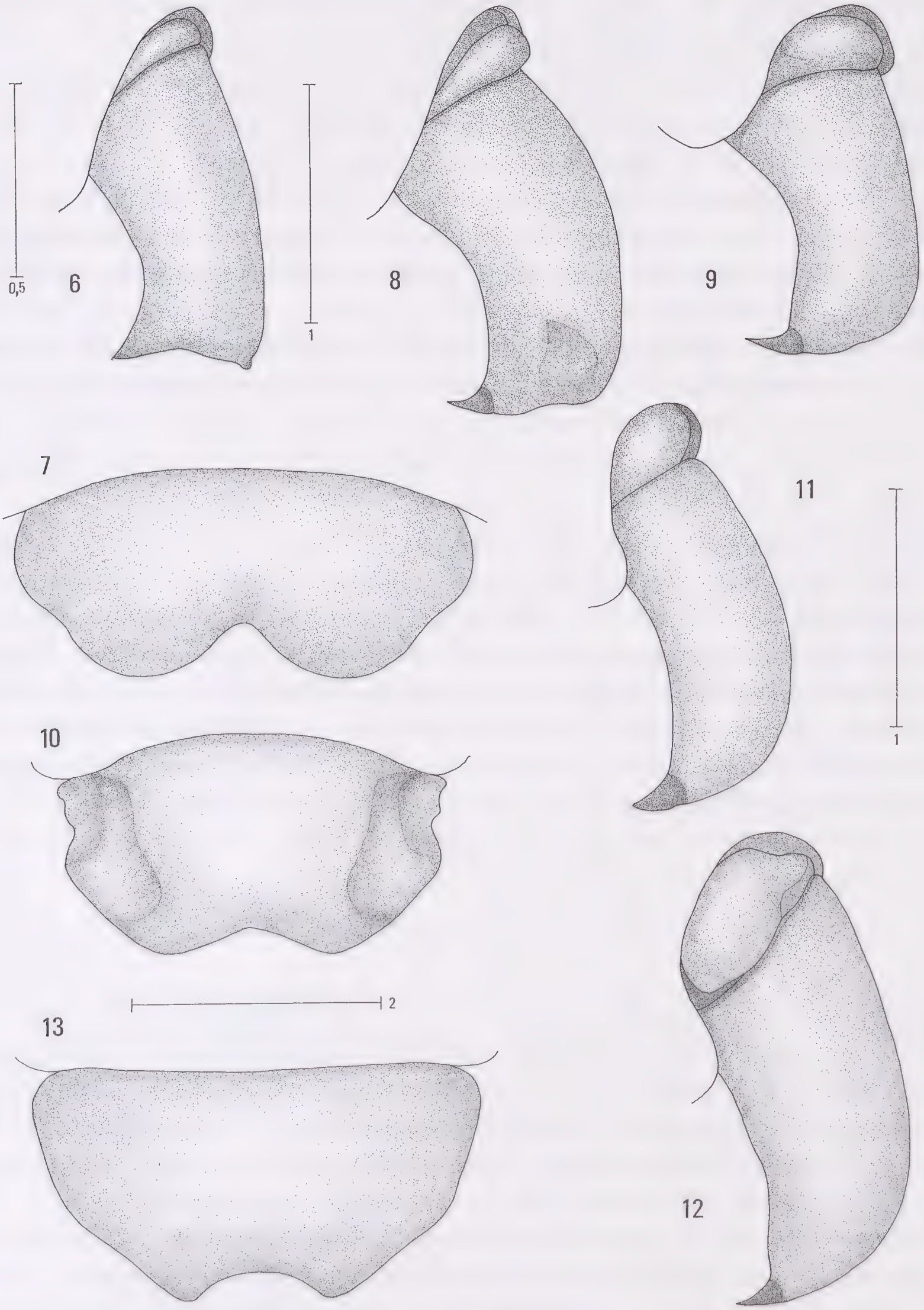
Le dimensioni del maschio subadulto (Allotypus) sono le seguenti:

Lunghezza corpo	mm	14,83
Larghezza vertice del capo	mm	0,65
Lunghezza pronoto	mm	3,50
Larghezza massima pronoto	mm	3,48
Lunghezza tegmine	mm	0,66
Lunghezza femori posteriori	mm	8,50

PATRIA TIPICA

Si è detto che Targioni Tozzetti (1881), descrivendo la specie, indicò genericamente la provenienza dei due esemplari dall'Appennino presso Firenze. È stato Cavanna a fornire una più ristretta località d'origine dei medesimi, la Consuma, nei *Resoconti delle adunanze della Società Entomologica Italiana* del 1881, a pagina 19, riferendosi alla precedente esposizione fatta da Targioni Tozzetti.

Si tratta di un territorio a circa 27 chilometri ad Oriente della città di Firenze, ad un'altitudine poco superiore ai 1000 metri s.l.m., il cui passo (Passo della Consuma, m 1050) mette in comunicazione la Provincia di Firenze con il Casentino (Arezzo).



Figg. 6-13. *Anonconotus apenninigenus* (Targioni Tozzetti, 1881), (Appennino presso Firenze: Consuma, St. Ilario): 6 - Cerco destro in visione dorsale, maschio (Allotypus); 7 - lamina sottogenitale in visione ventrale, femmina (Holotypus) *Anonconotus ligustinus* Galvagni, 2002:8 - cerco destro in visione dorsale, maschio (Holotypus), Alpi Liguri, Punta Maguaréis; 9 - idem, maschio (Paratypus), Piemonte, Colle di Tenda; 10 - lamina sottogenitale in visione ventrale, femmina (Paratypus), Piemonte, Colle di Tenda. *Anonconotus sibyllinus* Galvagni, 2002. 11 - cerco destro in visione dorsale, maschio (Holotypus), Monti Sibillini, Monte Sibilla; 12 - idem, maschio (Paratypus), Monti Sibillini, Forca Viola; 13 - lamina sottogenitale in visione ventrale, femmina (Paratypus) Monti Sibillini, Monte Sibilla. Scale: 0,5 mm (6), 1 mm (8, 9, 11, 12), 2 mm (7, 10, 13). Disegni dell'autore.

Al giorno d'oggi vi si trovano ancora vaste zone incolte, a pascolo, ma da informazioni avute presso i Comuni della zona, il paesaggio è notevolmente cambiato nel corso dell'ultimo secolo per il massiccio intervento dell'uomo. Dalle notizie avute presso le stesse fonti, sembra non si trovi sul luogo una località chiamata "St. Ilario", precisata nel cartellino dei tipi di *A. apenninigenus* del Museo di Firenze.

Recenti esplorazioni effettuate da Carron et al. (2002: 888, pubblicata a dicembre) alla Consuma e sui monti circumvicini, come il Monte Falterona a Nord-Est della medesima e la Catena di Pratomagno (Casentino) a Sud, non hanno dato esiti positivi sulla presenza dell'ortottero.

A seguito di ciò, detti Autori hanno ritenuto di considerare come "non identificabile" la località originaria di Targioni Tozzetti (1881) ed hanno ridescritta la specie *A. apenninigenus* su esemplari provenienti da gruppi montuosi che sorgono più a Sud, a circa 160 chilometri dalla zona ritenuta classica: i Monti Sibillini (Appennino Umbro-Marchigiano) e i Monti Reatini (Appennino Laziale).

Se non che in una mia nota, (Galvagni, 2002), pubblicata a novembre, ho dimostrato che le popolazioni di *Anonconotus* che vivono sui Monti Sibillini posseggono, nelle morfologie dei cerci del maschio e nella lamina sottogenitale della femmina, significative e peculiari caratteristiche che le distinguono dagli esemplari tipici di *A. apenninigenus* (Targioni Tozzetti, 1881); ciò mi ha indotto ad istituire la nuova specie *Anonconotus sibyllinus* Galvagni, 2002, munita anche di titillatori del maschio che non possono essere comparati con quelli dell'antica specie, perché ignoti, ma che differiscono notevolmente dalle entità alpine del genere. Gli esemplari descritti da Carron et al., 2002, sono pertanto da riferirsi ad *A. sibyllinus* e non ad *A. appenninigenus* come erroneamente sostenuto dai suddetti Autori.

CONCLUSIONI

Lo studio da me intrapreso su un gran numero di esemplari di *Anonconotus*, provenienti da molte popolazioni di località alpine ed appenniniche, mi ha convinto dell'importanza che possono avere, nella sistematica di questo genere, le strutture dei cerci del maschio e spesso della lamina sottogenitale della femmina, come caratteri complementari non trascurabili, anche se talvolta variabili entro limiti definibili, nell'ambito delle singole specie.

Nel caso di *A. apenninigenus*, i cerci dell'Allotypus maschio, esaminati dorsalmente (fig. 6), sono notevolmente diversi da quelli dei maschi delle popolazioni dei Monti Sibillini (figg. 11, 12), tanto da poter escludere, a mio giudizio, la loro appartenenza ad un'unica specie, anche in assenza di un confronto dei titillatori. Come ho avuto modo di far notare (Galvagni, 2002: 28), la struttura dei cerci del maschio di *A. apenninigenus* si avvicina, piuttosto considerevolmente, a quella dei maschi delle popolazioni più a settentrione, che vivono sulle Alpi Liguri occidentali (figg. 8, 9) e che ho distinte nella specie *A. ligustinus* Galvagni, 2002.

La distinzione delle tre specie di *Anonconotus* (*A. apenninigenus, A. sibyllinus* e *A. ligustinus*) si rispecchia anche nella struttura della lamina sottogenitale delle femmine, come risulta dal confronto delle figure 7, 10, 13.

Si ritiene pertanto necessaria un'accurata ricerca della specie *A. apenninigenus* nell'ambito di tutto l'Appennino Tosco-Emiliano, tenendo presente che in Italia il genere in argomento, ai margini meridionali della sua distribuzione, è presente con popolazioni rare, relitte, composte per lo più da non molti esemplari che vivono in aree assai ristrette. A causa del loro delicato equilibrio biologico, non sempre esse hanno avuta la possibilità di essere preservate, nel tempo, dalle conseguenze di fattori climatici a loro avversi o dall'azione distruttiva dell'uomo sul loro ambiente di vita.

Ne è un valido esempio la scomparsa di una piccola popolazione di *Anonconotus* sp. segnalata, poco meno di un secolo fa, da Krauss (1909: 142) come *A. alpinus* (Yersin) per la cima del Monte Altissimo di Nago (2076 m, Gruppo del Monte Baldo) nel Trentino meridionale (Italia settentrionale).

Ringraziamenti

Rinnovo vivi ringraziamenti al Prof. Marco Vannini, Direttore del Museo Zoologico "La Specola", Università degli Studi di Firenze e al Dr Luca Bartolozzi, responsabile del settore Entomologia del Museo medesimo, per avermi affidato in studio i Tipi di *Anonconotus apenninigenus* (Targioni Tozzetti, 1881). Porgo inoltre il mio grazie ai Sindaci dei Comuni di Pelago (Firenze) e di Pratovecchio (Arezzo) per la cortese disponibilità dimostrata dai loro Uffici nel fornirmi utili informazioni sulla ricerca delle località interessate e sulle situazioni ambientali dei loro territori, passate ed attuali.

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Marcello La Greca[1]

Two new species of Acridomorpha from Afghanistan with description of a new genus (Orthoptera)

Abstract - The Author describes *Cryptonothrotes pseudoapterus* **n. gen.** and **n. sp.** (Orthoptera Pamphagidae Pamphaginae) and *Iranella simonettai* **n. sp.** (Orthoptera Acrididae Catantopinae) from Afghanistan. *Cryptonothrotes* n. gen. is characterised by the male tegmina showing a quite exceptional shape, not even exceeding the metatergum and nevertheless widely overlapping each other at the apex. The female is apterous. *Iranella simonettai* n. sp. is well characterized within the genus, that comprises another four species.

Riassunto - *Due nuove specie di Acridomorpha dell'Afghanistan con descrizione di un nuovo genere (Orthoptera).*
L'Autore descrive *Cryptonothrotes pseudoapterus* **n. gen.** e **n. sp.** (Orthoptera Pamphagidae Pamphaginae) e *Iranella simonettai* **n. sp.** (Orthoptera Acrididae Catantopinae) dell'Afganistan. *Cryptonothrotes* n. gen. è caratterizzato dalle tegmine del maschio che hanno una forma eccezionale, non prolungandosi oltre il metatergo ed essendo sovrapposte all'apice. La femmina è attera. *Iranella simonettai* n. sp. è ben riconoscibile dalle quattro specie note del genere.

Key words: Orthoptera, *Cryptonothrotes pseudoapterus* n. gen. and n. sp., *Iranella simonettai* n. sp., taxonomy, Afghanistan.

Introduction

Prof. Alberto Simonetta of the Florence University (Italy) very kindly provided me a collection of Orthoptera collected by him during a faunistic research trip in Afghanistan, including some interesting novelties which I communicate in this paper. They are a new species of *Pamphaginae* (Pamphagidae) which requires the establishment of the new genus *Cryptonothrotes*, and a new species of *Iranella* (Catantopinae Acrididae).

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[1] After the death of Prof. Marcello La Greca, on 10 February 2001, Mrs Caterina Meduri La Greca entrusted Paolo Fontana, one of the pupils of her husband, to collect together and examine all his documents (paper and files on PC), to conclude the researches that La Greca was unable to ultimate. Marcello La Greca left a partly incomplete manuscript concerning two new species and a new genus from Afghanistan, and some drawings partly unfinished describing them. On the basis of the incomplete manuscript and after the study of La Greca handwritten notes and the specimens that he did not sell to the Museo Civico di Storia Naturale of Milan, P. Fontana was able to finish the article, also assembling La Greca's drawings.

Fam. Pamphagidae

Cryptonothrotes n. gen.

Male of medium size, female very large, body compressed. Integument strongly granulose. Antennae filiform much shorter than head and pronotum together, with two last articles very long and depressed (fig. 1). Fastigium of vertex pentagonal, strongly sloping forward, above concave with apex excised and well developped lateral carinulae (fig. 2). Frons vertical, excised at ocellus (fig. 3); frontal ridge narrow, open at the apex, constricted at the ocellus, sulcate, strongly diverging in lower sector. Three occipital carinulae are connected by many transversal carinulae.

Pronotum crestlike, tectiform with sharp median carinula, scarcely to well raised, not crossed by any sulcus; lateral carinae absent. Anterior and posterior borders elongate, angular. Prosternal process conical, elongated, truncate (figs 6 and 7). Mesosternal interspace wider than long. Tegmina (figs 4 and 8) present only in the male, strongly reduced, hardly visible and nearly entirely concealed under the pronotum; they are wider than long and overlapping each other at the apex; veins still valuable. Wing vestigial in the male, absent in the female.

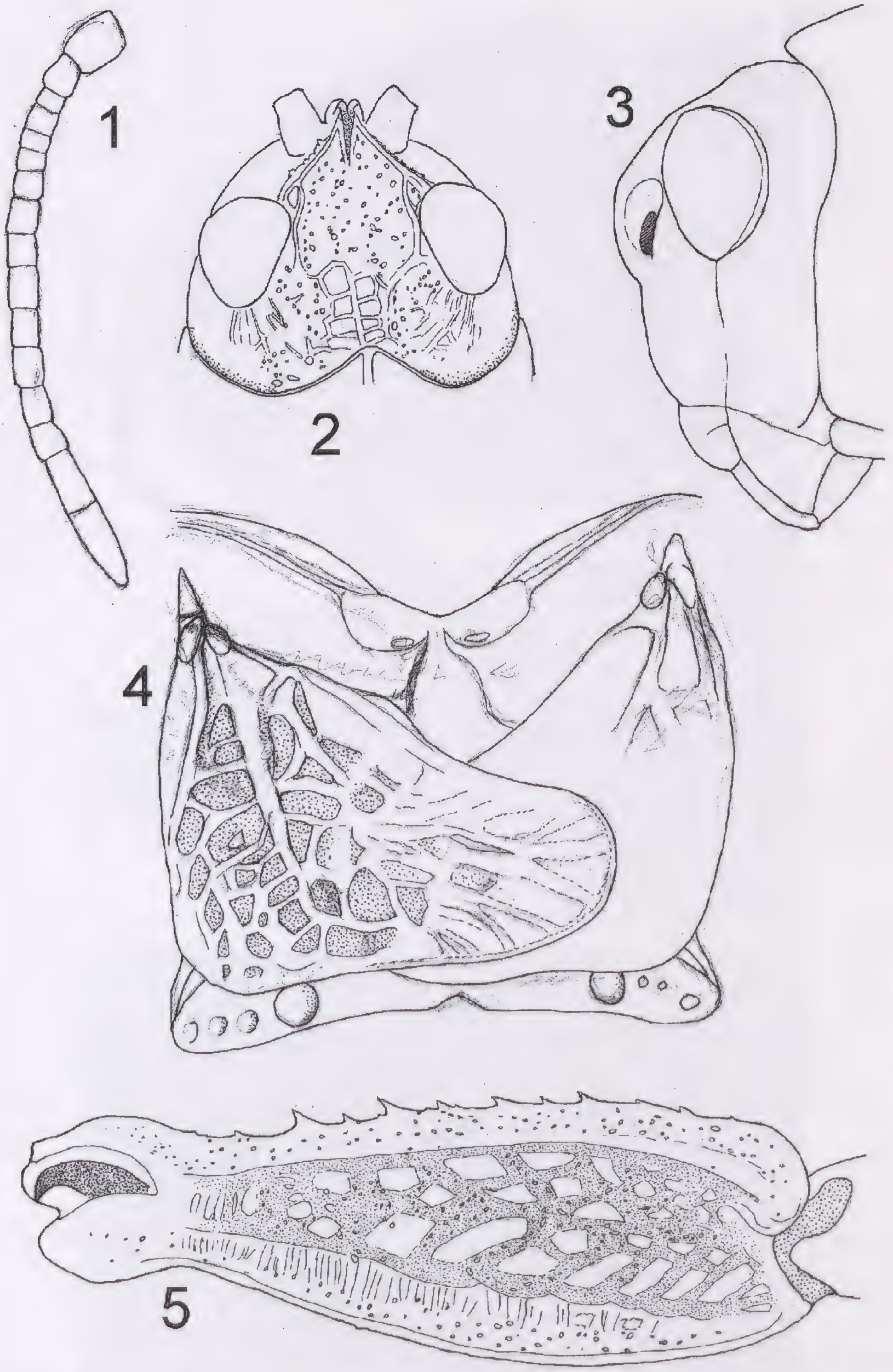
Hind femurs (fig. 5) with toothed upper carina and lower carina slightly wavy; the upper marginal area of the external side extends as far as the apex of femurs without a narrowing; the lower marginal area is slightly expanded in the central part. Hind tibiae bearing the external apical spine.

Tympanum present and open; Krauss's organ absent. Abdomen compressed with a median keel; 1st urotergum completely granulose, the next 3-4 only partly granulose. Cerci in the male conical with a swollen basal half, slightly upcurved; in the female strongly reduced but stout. Supra-anal plate with acute angular apex. Subgenital plate in the male short, conical. Ovipositor robust with straight ventral valves. Epiphallus with short and close ancorae and protruding posterior end; the two clusters of small teeth are fused (fig. 9).

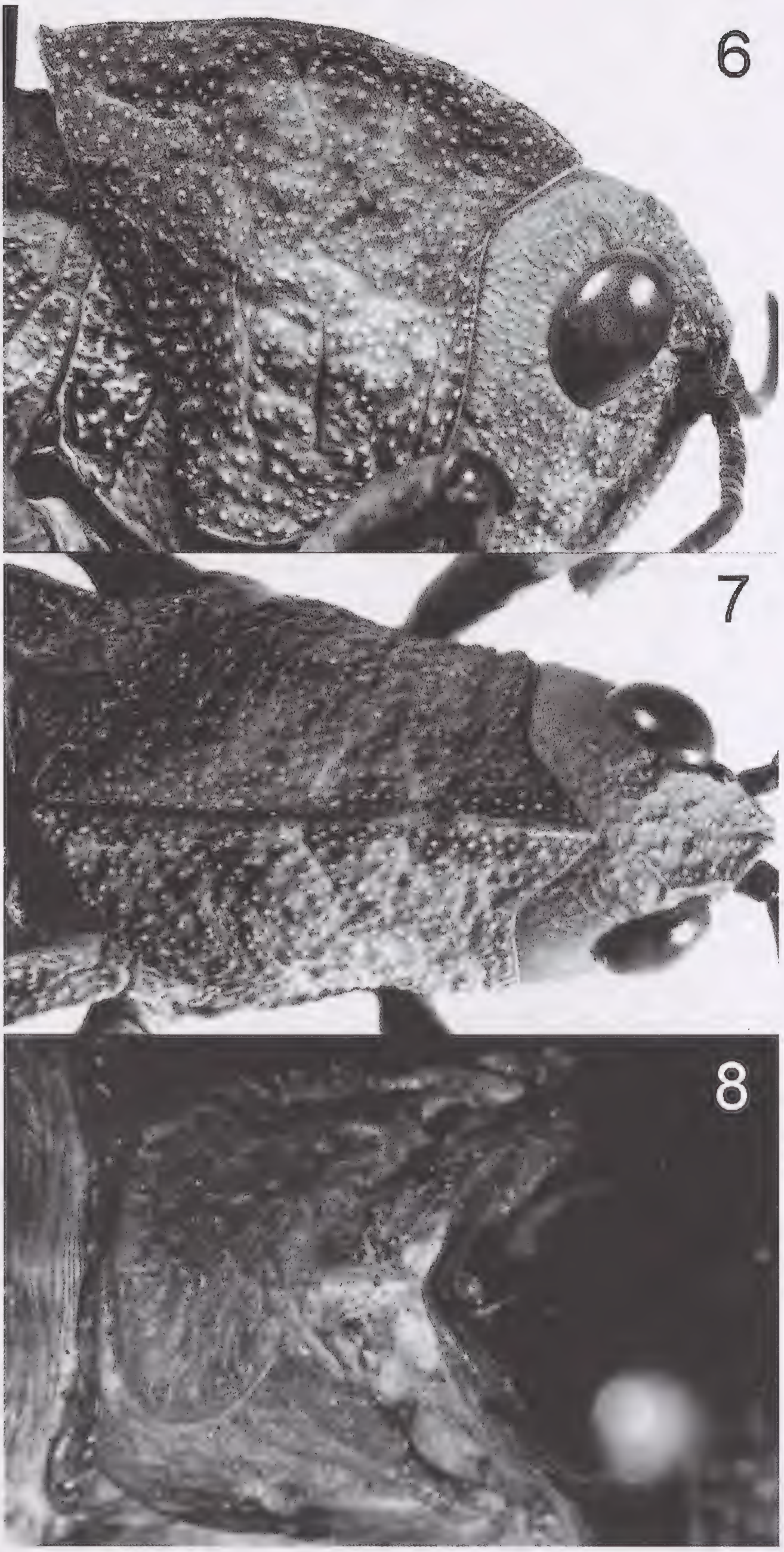
GENEROTYPE: *Cryptonothrotes pseudoapterus* n. sp.

DERIVATIO NOMINIS: The name of the new genus *Cryptonothrotes* means concealed (*Crypto-*) and indolent (*-nothrotes*).

In the Palaearctic Asia the subfamily *Pamphaginae* includes less than score genera, all apterous except *Mistshenkoella* Cejchan, 1969, which has brachypterous male and micropterous female, and *Haplotropis* Saussure, 1888, furnished with a pair of lateral parabolic tegmina, very reduced, which hardly exceed the first urotergum. In the new genus tegmina have an extremely peculiar shape, not even exceeding the metatergum, nevertheless widely overlapping each other at the apex. Owing to the tympanum presence and to the toothed upper keel, it seems related to *Tropidauchen* Saussure, 1887 and *Saxetania* Mistschenko, 1951 which, however, are completely apterous. According to Shumakov (1963) and Presa & Garcia (1983) I consider *Afghanacris* Ramme, 1952, as junior synonym of *Saxetania.*



Figs 1-5. *Cryptonothrotes pseudoapterus* n. gen and n. sp.: 1 - left antenna of the male paratype; 2 - dorsal view of the male paratype head; 3 - lateral view of the male holotype head; 4 - dorsal view of male holotype tegmina; 5 - lateral view of male holotype right leg. Original drawings by M. La Greca.



Figs 6-8. *Cryptonothrotes pseudoapterus* n. gen and n. sp.: 6 - lateral view of male paratype head and pronotum; 7 - idem, dorsal view; 8 - dorsal view of male holotype tegmina. Photos M. La Greca.

Cryptonothrotes pseudoapterus n. sp.

EXAMINED MATERIAL: Afghanistan, between Herat and Qal' eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, mountain slope, 3000 m, stony and very arid habitat, 8-16/VI/1977 A. Simonetta leg., 1 M, 1 F, *holotype* and *allotype* (coll. La Greca, Museo Civico di Storia Naturale of Milan; same locality and date, 1 ♂, 2 ♀ ♀, *paratypes*, (1 ♂ e 1 ♀ coll. P. Fontana, 1 ♀ coll. La Greca, Museo Civico di Storia Naturale of Milan).

TYPE LOCALITY: Afghanistan, Herat district, between Herat and Qal' eh-ye Now, some Km before Sabzak Pass.

MALE. Brown. Antennae with 17 articles. Pronotum tectiform, with median keel slightly to well raised and with its anterior border strongly angular; sulci of the lateral lobes of pronotum are faint, chiefly in the central part of the lobes; in the upper part of pronotum, in a pit, are visible two lobes ending at the base of the median carina; in the lower part the submarginal and another two sulci are present. Abdomen compressed with a median keel evident along its length. The prosternal process is truncated, with flat anterior and convex posterior part. The anterior and middle tibiae have 7 inner and 7 outer spines; the two apical spines are shifted somewhat dorsally. The hind femura have the lower border slightly ondulated and the inner side black (except for the apex). Hind tibiae ochraceous, bearing 10 inner and 10 outer spines with black apex. Penis valvae elongated, as in figs 10, 11 and 12.

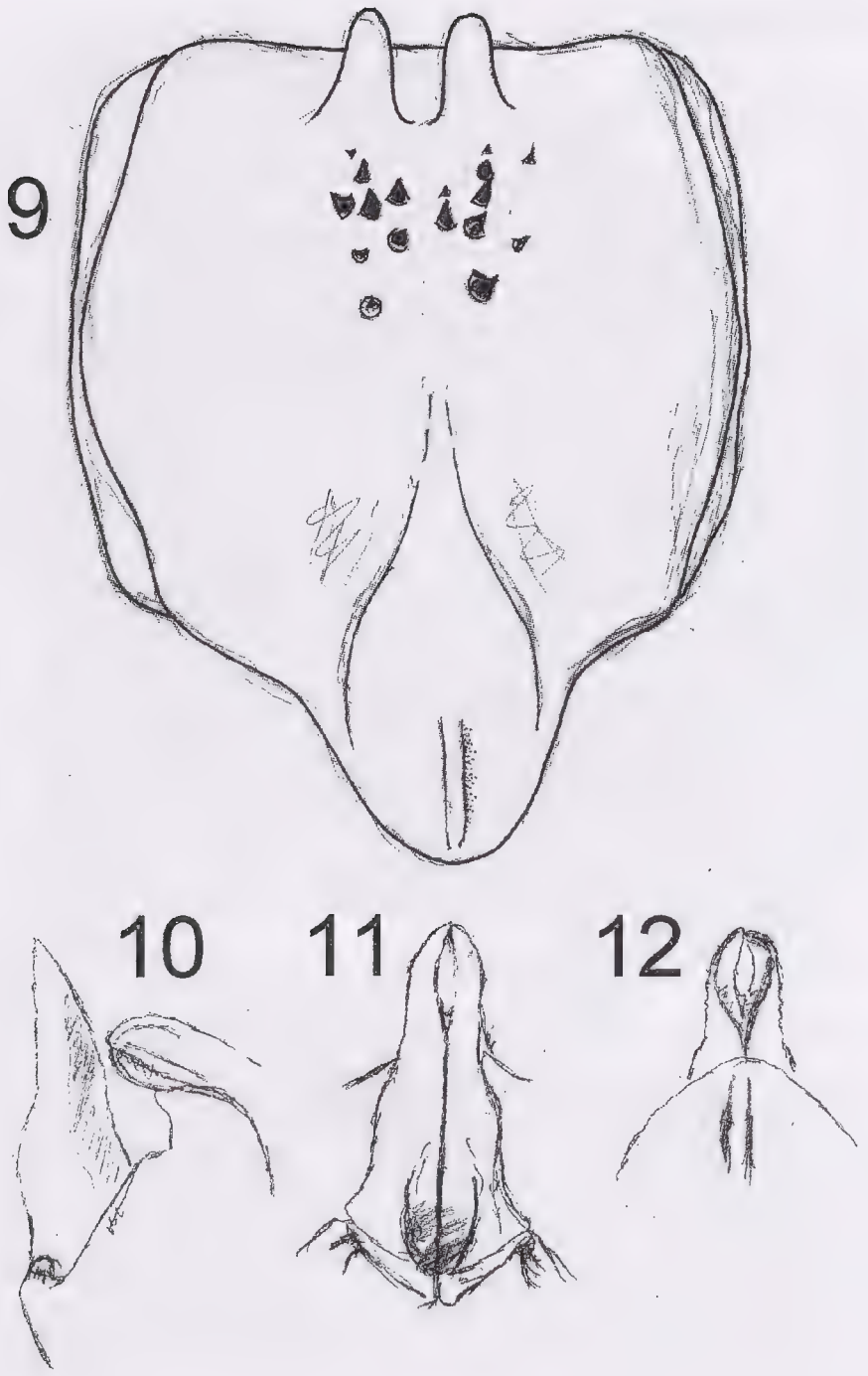
FEMALE: Brown. Very large and stout. Head large, stout. Pronotum tectiform, large and slightly arched. Abdomen compressed with a median keel more evident in the first tergites. Tegmina and wings absent. Hind femura, short in comparison with the body size, with the lower border slightly ondulated; the inner side black, except for the apex.

Tab. 1 - Main measures (in mm) of *Cryptonothrotes pseudoapterus* n. gen., n. sp.

	MALES	FEMALES
Total length (from vertex to hind femur apex)	31.5-34.0	52.0-53.2
Pronotum length	10.2-11.5	15.5-18.5
Pronotum heigth	9.5-10.2	15.8-16.8
Hind femur length	15.5-17.0	24.0-25.0
Hind femur heigth	5.3-5.6	7.4-8.0

HABITAT: Prof. Simonetta informed me that *C. pseudoapterus* n. gen. and n. sp. lives on a stony and very arid habitat on the mountain not far from Sabzak Pass, at about 3000 m.

DERIVATIO NOMINIS: the specific name *pseudoapterus* means apparently (*pseudo*-) wingless (-*apterous*), after the peculiar position of the male tegmina.



Figs 9-12. *Cryptonothrotes pseudoapterus* n. gen and n. sp.: 9 - dorsal view of male holotype epiphallus; 10 - lateral view of male holotype Penis valvae; 11 - idem, posterior view; 12 - idem, dorsal view. Original drawings by M. La Greca.

Fam. Acrididae

Iranella simonettai n. sp.

EXAMINED MATERIAL: Afghanistan, Herat district, between Ghurian and the Iranian frontier, sub-desertic pastures on hills VI.1977, 1 ♂ (*holotype*), A. Simonetta leg., Museo Civico di Storia Naturale of Milan.

TYPE LOCALITY: Afghanistan, Herat district, between Ghurian and the Iranian frontier.

MALE: Small and stout; brown variegated with rusty spots. Integument of the face, fastigium of vertex, genae and pronotum spread with engraved dots. Antennae short, not reaching the middle transverse sulcus of pronotum, with 18 trasverse articles, except the scape, depressed and three times longer than wide. Frontal ridge, between the antennae delimitated by two parallel prominent carinulae, narrowing under the median ocellum and then vanishing. Many little and parallel carinulae depart from the internal border of eyes as a halo of rays. A linear median carinula runs along the occiput.

The prozona of pronotum is shorter than the metazona; a median linear carina is present in the anterior half of the metazona, as far as the submarginal sulcus, and then vanishes in the posterior one; the median carina reappears in the anterior half of metazona. The lateral carinae in the prozona are irregular and inconspicuous and are absent in the metazona which is strongly tuberculate with about ten thick and smooth tubercles on the dorsum; tubercles are rather absent from the prozona. Posterior border of pronotum showing a protruding right angle, with rounded apex. The prosternal process is rectangular, very broad, with right posterior margin.
Tegmina wide and short, as long as abdomen (in dried specimen), not reaching the end of hind femurs; apex transversally truncated. Clear brown in colour, with a withish dot in the middle of the anterior margin and subapical black-bluish evanescent spot. Wings colourless, well developped, as long as tegmina.
Hind femurs with upper carina, bearing two central little teeth. Hind tibiae ochraceous, its apex medially pink; spines ochraceous with brown apex.

Tab. 2 - Main measures (in mm) of *Iranella simonettai* n. sp.

	MALES
Body length (from vertex to hind femur apex)	17.8
Pronotum length	4.5
Metazona length	2.3
Tegmina length	11.0
Tegmina width	3.9
Hind femur length	9.3
Hind femur heigth	3.3

FEMALE: unknown.

HABITAT: It lives on subdesertic pasture of hills.

DERIVATIO NOMINIS: *Iranella simonettai* n. sp. is named after Prof. Alberto Simonetta of the Florence University (Italy) who kindly provided me material by him collected in Afghanistan and in particular the specimen of *Iranella simonettai* new species, with some information about its habitat.

The genus *Iranella* Uvarov, 1922 comprises four species: *I. eremiaphila* Uvarov, 1922 (Afghanistan and Iran), *I. rugosa* Shumakov, 1956 (Iran), *I. turcmena* Bey-Bienko, 1948 (Turkmenistan) (Shumakov, 1963) and *I. simonettai* n. sp. (Afghanistan).

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Paolo FONTANA

Remarks on the last taxa described by Marcello La Greca (*Cryptonothrotes pseudoapterus* and *Iranella simonettai*) and on some Acridomorpha species from Afghanistan (Orthoptera Acridomorpha)

Abstract - Additional illustrations concerning *Cryptonothrotes pseudoapterus* La Greca, 2004 and some illustrations of *Iranella simonettai* La Greca, 2004 are presented. Comments on the taxanomy, the ecology and a map showing the type localities of these taxa are also provided. Data concerning *Eremocharis granulosa clavicornis* Ramme, 1939, *Eremopeza bicoloripes* (Morits, 1928) and *Dericorys annulata* (Fieber, 1853) are also presented.

Riassunto - *Note sugli ultimi taxa descritti da Marcello La Greca* (Cryptonothrotes pseudoapterus *and* Iranella simonettai) *e su alcune specie di Acridomorpha dell'Afghanistan (Orthoptera Acridomorpha).*
Sono presentate illustrazioni supplementari relative a *Cryptonothrotes pseudoapterus* La Greca, 2004 e le prime illustrazioni relative ad *Iranella simonettai* La Greca, 2004. Sono inoltre forniti commenti sulla tassonomia, l'ecologia e una mappa con l'indicazione delle località tipiche delle due specie. Vengono presentati dati relativi a *Eremocharis granulosa clavicornis* Ramme, 1939, *Eremopeza bicoloripes* (Morits, 1928) e *Dericorys annulata* (Fieber, 1853).

Key words: Orthoptera, taxonomy, ecology, Afghanistan.

INTRODUCTION

The Orthopteroid insect fauna of Afghanistan (fig. 1) have been studied by several and famous orthopterologists during XX century. Mistshenko (1937) published some data concerning Blattodea, Mantodea, Phasmodea and Orthoptera of North Afghanistan; Ramme (1952) exposed the results on Tettigoniidae and Acrididae from Afghanistan of the The 3rd Danish Expedition to Central Asia. E. M. Shumakov firstly described some new species (Shumakov, 1956) and some years later published a very exaustive volume about the Acridoidea of Afghanistan and Iran (Shumakov, 1963). G. Ya Bey-Bienko written two contributes on the Orthopteroid insect fauna of Afghanistan (Bey-Bienko, 1963 and 1967) and A. Cejchan published two contributes in the same year, one concerning the Tettigonoidea (Cejchan, 1969a) and the other concerning the Acridoidea (Cejchan, 1969b) of Afghanistan.

Some Italian zoologists curried out in 1977 a naturalistic expedition in Afghanistan. Alberto Simonetta (University of Florence), one of the partecipants of the Italian expedition, collected some ortoptera and provided this material (about 40 specimens) to Marcelo La Greca (University of Catania). M. La Greca studied immediatly the material and individuated some taxa new for science.

M. La Greca posponed the pubblication of these new interesting data for several years, probably waiting further related materiald and only few months before he died,

he wrote an article that he had not the time to publish. After the death of Prof. Marcello La Greca (Fontana, 2002), Mrs Caterina Meduri La Greca provided me a partly incomplete manuscript of his husband, concerning two new species and a new genus of Acridomorpha from Afghanistan, some drawings partly unfinished describing them and the relative speciemens, that M. La Greca did not sell to the Museo Civico di Storia Naturale of Milan to finish his work. On the basis of the incomplete manuscript and after the study of La Greca handwritten notes and of the related specimens, I was able to finish his article (La Greca, 2004). I decided to change less as possible La Greca's manuscript and to use only his drawings and to provide in this article, additional illustrations and comments on the new intereseting taxa described by Marcello La Greca and on the other material form Afghanistan. On the basis of La Greca's documents I was able to localize the type localities of the new taxa, to prepare a map, and to describe further ecological remarks. Within the Orthoptera from Afghanistan that Marcello La Greca studied are present some interesting species that will be listed and two probably new species of the genus *Saxetania* Mistschenko, 1951, the study of which is still in progress. The systematic arrangement follows Otte (1994, 1995).

Family PAMPHAGIDAE

Subfamily Akicerinae

Tribe Trinchini

Eremocharis granulosa clavicornis Ramme, 1939

EXAMINED MATERIAL: AFGHANISTAN, Bamian region, Band-e-Amir Lakes, 3200 m, dry slopes, A. Simonetta leg., 5 ♂♂, 1 ♀ nymph, 2 ♀♀ (3 ♂♂, 1 ♀, coll. P. Fontana; 3 ♂♂, 1 ♀ nymph, 2 ♀♀, coll. La Greca, Museo Civico di Storia Naturale of Milan).

COMMENTS. *Eremocharis granulosa clavicornis* Ramme, 1939, listed as *E. clavicornis* Ramme, 1939 by Shumakov (1963), was known only for the male type and from the type locality (Afghanistan, 50 km south of Kabul). New data are very interesting, both for the new locality and for the first females of this rare species till now found.

Eremopeza bicoloripes (Morits, 1928)

EXAMINED MATERIAL: Afghanistan, Rubat Sabeha, 18.VI.1977, A. Simonetta leg., 1 ♂, 1 ♀ (coll. P. Fontana); Afghanistan, between Herat and Qal'eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, mountain slope, 3000 m, stony and very arid habitat, 8-16/VI/1977 A. Simonetta leg., 2 ♂♂, 1 ♂ nymph, 1 ♀ (coll. La Greca, Museo Civico di Storia Naturale of Milan); Afghanistan, between Herat and Qal' eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, 2200 m, dump pastures in valley bottom, 8-16/VI/1977 A. Simonetta leg., 2 ♂♂, 3 ♀♀, (1 ♂, 1 ♀, coll. La Greca, Museo Civico di Storia Naturale of Milan; 1 ♂, 1 ♀, coll. P. Fontana); Afghanistan, between Herat and Qal' eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, 8-16/VI/1977 A. Simonetta leg., 2 ♂♂, 3 ♀♀, (1 ♂, 2 ♀♀, coll. La Greca, Museo Civico di Storia Naturale of

Milan; 1 ♂, 1 ♀, coll. P. Fontana); Afghanistan, Herat district, between Ghurian and the Iranian frontier, subdesertic pastures on hills, A. Simonetta leg., VI.1977, 2 ♂♂, 5 ♀♀ (1 ♂, 4 ♀♀, coll. La Greca, Museo Civico di Storia Naturale of Milan; 1 ♂, 1 ♀, coll. P. Fontana).

COMMENTS. *E. bicoloripes* seems to be very common in Afghanistan where it lives in many different habitats. This species is known from Iran, Afghanistan and Pakistan (Bey Bienko & Mistschenko, 1951; Schumakov, 1963).

Subfamily Pamphaginae

Tribe Pamphagini

Cryptonothrotes pseudoapterus La Greca, 2004

EXAMINED MATERIAL: Afghanistan, between Herat and Qal' eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, mountain slope, 3000 m, stony and very arid habitat, 8-16/VI/1977 A. Simonetta leg., 1 ♂, 1 ♀, *holotype* and *allotype* (coll. La Greca, Museo Civico di Storia Naturale of Milan; same locality and date, 1 ♂, 2 ♀♀, *paratypes*, (1 ♂ e 1 ♀ coll. P. Fontana, 1 ♀, coll. La Greca, Museo Civico di Storia Naturale of Milan).

TYPE LOCALITY. AFGHANISTAN, Herat district, between Herat and Qal' eh-ye Now, some Km before Sabzak Pass (fig. 25).

COMMENTS. The genus *Cryptonothrotes* La Greca, 2004 is very similar to the genus *Paktia* Pfadt, 1970, also described from Afghanistan. In the only know species of the genus, *Paktia gardezae* Pfadt, 1970, male tegmina reach third abdomianl tergite while in the female tegmina are concealed under the pronotum and scale-like. Furthermore Mason (1959) described the presence of reduced tegmina and wings in *Tropidauchen marginatum* Bolivar, 1912 (from Iran), belonging to a supposedly apterous genus. In *Tropidauchen marginatum* male and female are both winged and in both sexes tegmina are concealed under the pronotum and scale-like and only about 3 mm long. In *Cryptonothrotes pseudoapterus* La Greca, 2004 the male has well developed wings (tegmina are reduced, nearly entirely concealed under the pronotum but they overlap each other at the apex) while female has only small scale-like wings, about 2 mm long (figs 25-26).

Tab.1 - Main differences within *Paktia gardeza*, *Tropidauchen marginatum* and *Cryptonothrotes pseudoapterus*.

Species	male tegmina	female tegmina
Paktia gardeza	reaching third abdomianl tergite	concealed under the pronotum and scale-like
Tropidauchen marginatum	concealed under the pronotum and scale-like	concealed under the ronotum and scale-like
Cryptonothrotes pseudoapterus	not completely concealed under the pronotum and overlapping each other at the apex	concealed under the the pronotum and scale-like

The exam of the inner surface of the male tegmina of *C. pseudoapterus* showed the presence of some wrinkles, more evident in the proximal part and of two crests, present under the tegmina on each side of metanotum. These structures, as well all the very peculiar shape of the tegmina of the male of *C. pseudapterus*, could suggest the possibility of a physiological meaning, that could be involved in sound production, as known in other species of Pamphaginae (Johnsen, 1972; Ingrisch, 1983) and in particular in *Paktia* (Pfadt, 1970).

ACCOMPAINIG SPECIES. In La Greca's material from Afghanistan there are one male and one female of *Saxetania* sp. 1 and some specimens of *Eremopeza bicoloripes* (Morits, 1928) from the same locality and habitat (3000 m) of *Cryptonothrotes pseudoapterus* La Greca, 2004.

Family ACRIDIDAE

Subfamily Dericorythinae

Dericorys annulata (Fieber,1853)

EXAMINED MATERIAL: Afghanistan, between Herat and Qal' eh-ye Now (=Qala-i-Nau), some Km before Sabzak Pass, 8-16/VI/1977 A. Simonetta leg., 1 ♂ nimph, 1 ♀ (coll. P. Fontana).

COMMENTS. *D. annulata* (Fieber,1853) was recorded from Eastern Afghanistan by SHUMAKOV (1963). The new data extend its distribution to north-western Afghanistan. *D. annulata* is known from Iran and Afghanistan (SHUMAKOV, 1963), Southern Kazakhstan, western Kirghizia, Turkmenia, Kara-Kalpak, Uzbekistan, southern Tadzhikistan, West China and northwestern Mongolia [MISTSHENKO, 1952, sub. *D. annulata roseipennis* (Redtenbacher, 1889)].

Subfamily Catantopinae

Tribe Iranellini

Iranella simonettai La Greca, 2004

EXAMINED MATERIAL: Afghanistan, Herat district, between Ghurian and the Iranian frontier, subdesertic pastures on hills VI.1977, 1 ♂ (*holotype*), A. Simonetta leg., Museo Civico di Storia Naturale of Milan.

TYPE LOCALITY. Afghanistan, Herat district, between Ghurian and the Iranian frontier (fig. 27).

COMMENTS. In the last version of the Orthoptera Species File Online, Version 2 (OTTE et al., 2002) the genus *Iranella* Uvarov, 1922 belongs to the family Dericorythidae, the subfamily Iranellinae and the tribe Iranellini Mistshenko, 1952. The tribe Iranellini in-

cludes three genera: *Iranella* Uvarov, 1922, *Iraniobia* Bey-Bienko, 1954 and *Iraniola* Bey-Bienko, 1954. In the genus *Iranella* are listed up to date four species: *I. eremaphila* Uvarov, 1922, *I. rugosa* Shumakov, 1956, *I. turcmena* Bey-Bienko, 1948 and *I. simonettai* La Greca, 2004 (tab. 2).

Tab. 2 - The species of the genus *Iranella* Uvarov, 1922.

Species	Author	Type locality	distribution	Type material
I. eremaphila	Uvarov, 1922	Irak, Abadekh	Irak, Afghanistan, Iran	Male holotype: BMNH, London
I. rugosa	Shumakov, 1956	Iran, Kerman, Bakhramdzherd	Iran	Female holotype: ZIN, St. Petersburg
I. turcmena	Bey-Bienko, 1948	Turkmenistan: Akhcha-Kuima	Turkmenistan	Male holotype: ZIN, St. Petersburg
I. simonettai	La Greca, 2004	Afghanistan, Ghurian-Iranian frontier	Afghanistan	Male holotype: MCST, Milan

Tab. 3 - Main charachters of the species of the genus *Iranella* Uvarov, 1922.

Species	hind tibia dorsal apical spine	prosternum process	male supra anal plate	wing colour
I. eremaphila	absent	wide	transverse	transparent, blue proximally
I. rugosa	present	narrow	elongated	?
I. turcmena	present	narrow	elongated	transparent, blue proximally
I. simonettai	absent	wide	elongated	colourless

According to the original description, *I. rugosa* Shumakov, 1956 has strongly shorthened tegmina, not longher than pronotum in both male and female. Besides, the only illustration of this species, presented by Shumakov (1963), does not feet with the original description (Shumakov, 1956); furthermore the author does not mention the wing colour of the species.

As presented in tab. 2, *I. simonettai* La Greca, 2004, can be easily identified within the genus, for the absence of the hind tibia dorsal apical spine, the wide prosternum process, the elongated male supra anal plate and the colourless wings.

ACCOMPAINIG SPECIES. In La Greca's material from Afghanistan there are some specimens of *Eremopeza bicoloripes* (Morits, 1928) from Ghurian, type locality of *I. simonettai*.

AKNOWLEDGMENTS

I'm glad to thank Mrs Caterina Meduri La Greca for her reliance in entrusting me to study the material of her husband, Marcello La Greca. Many Thanks to Fer Willemese (Eygelshoven, The Netherlands) for his kind help in providing me some concerning literature, to Andrey Gourov (Padua, Italy) for his help with Russian text translations and to my dear friend Bruno Massa (University of Palermo, Italy) for his critical lecture of the text and for suggestions about the literature on Pamphagidae.

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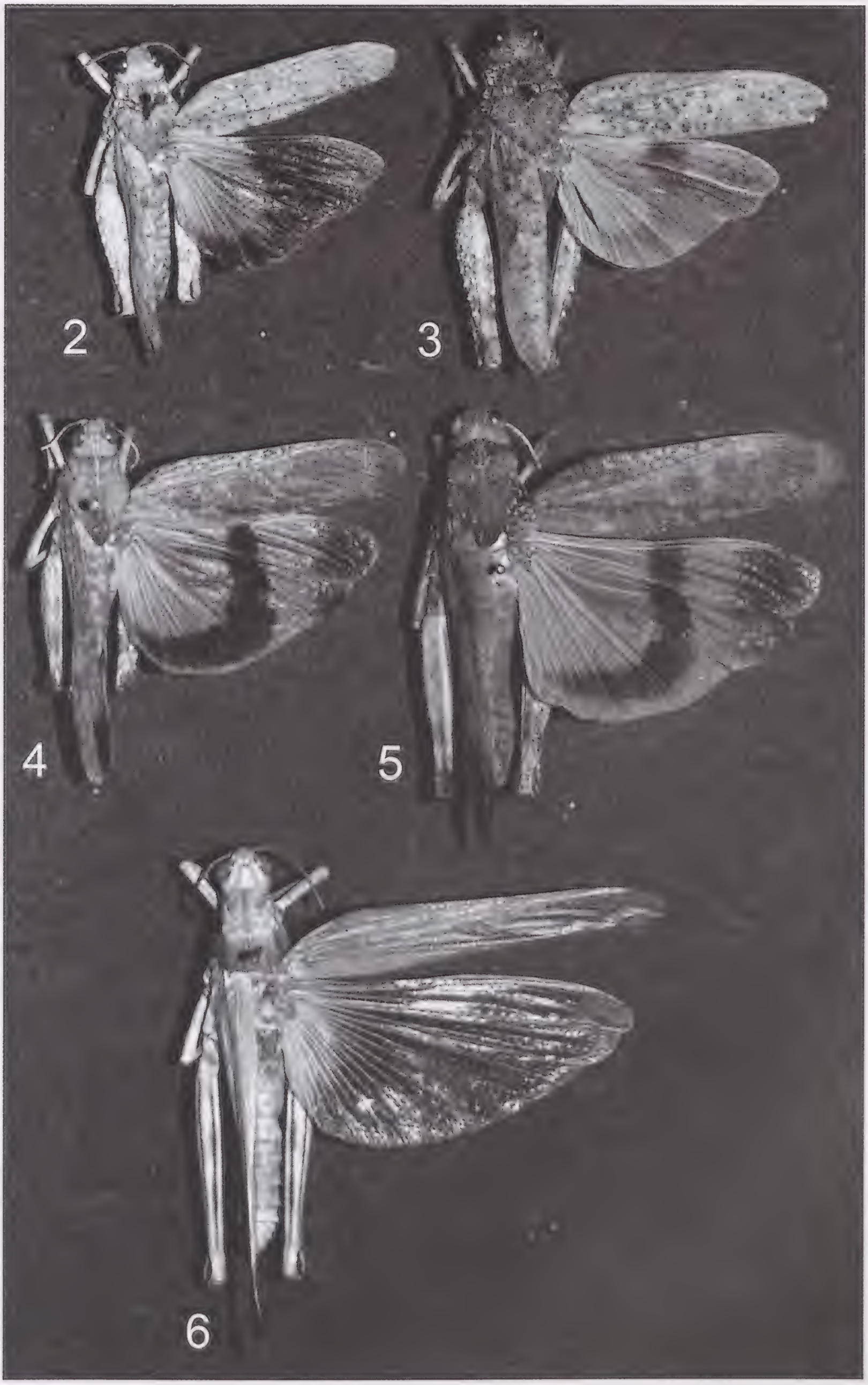
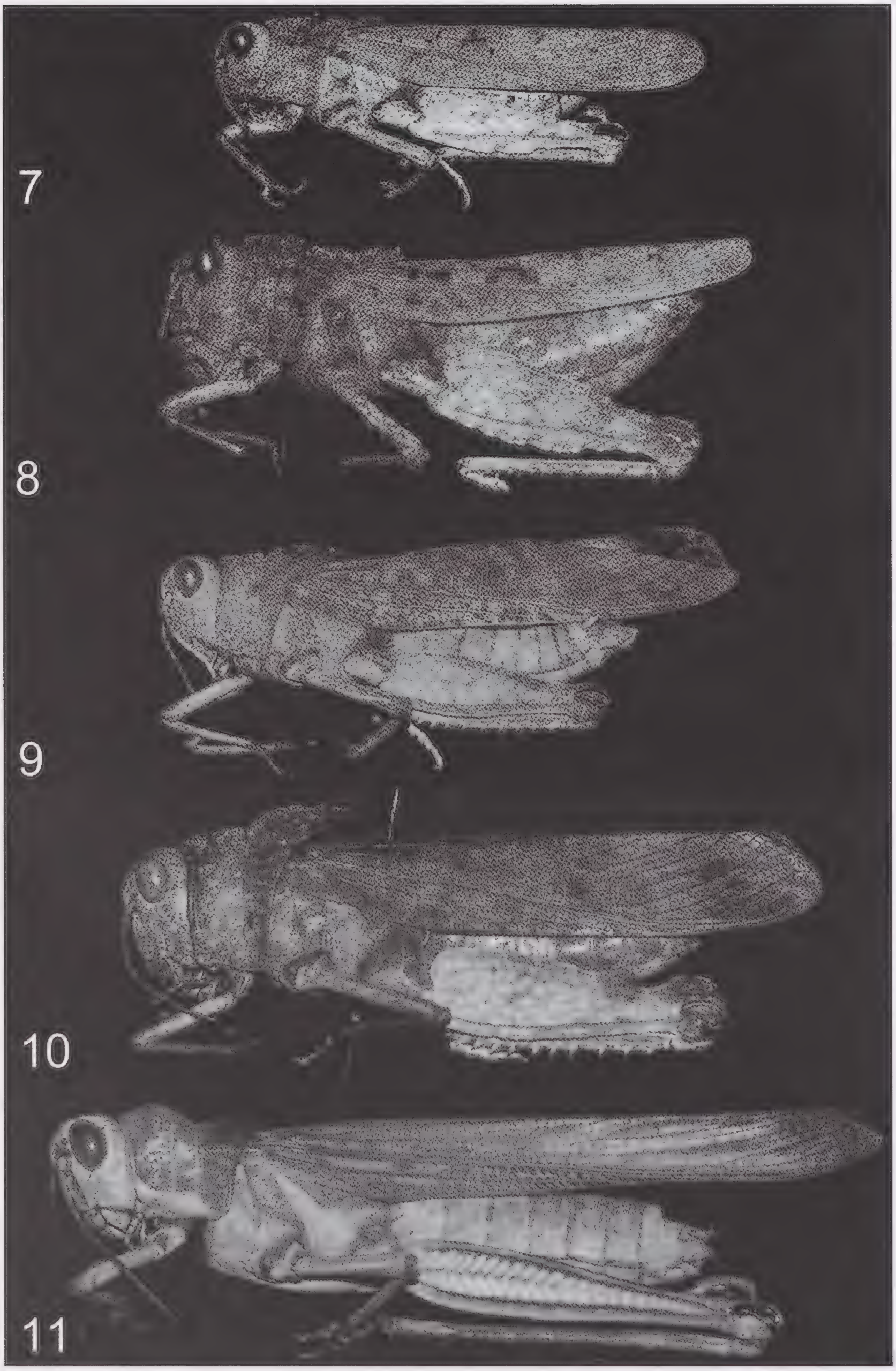
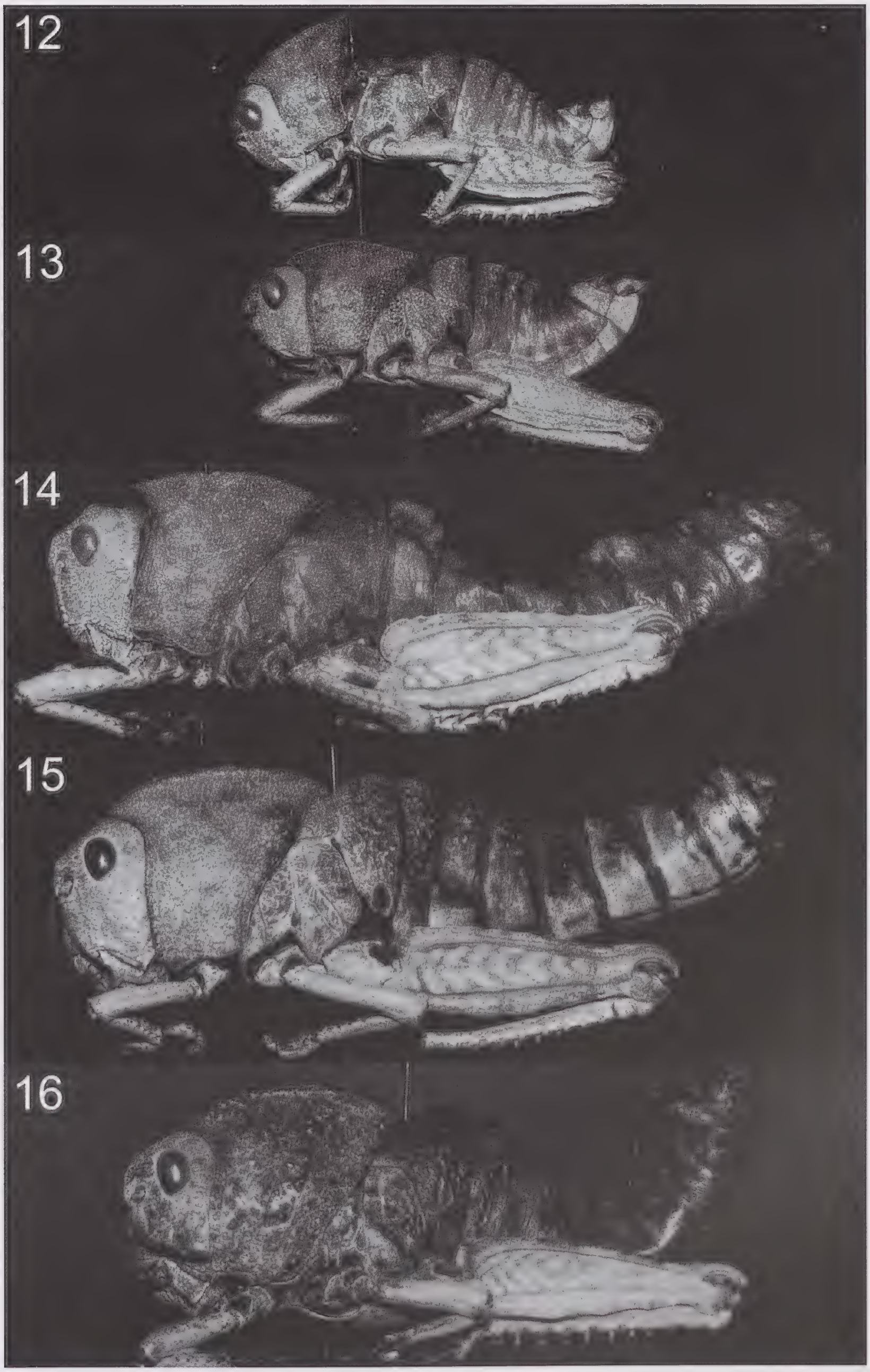
Fig. 1. Afghanistan general map.



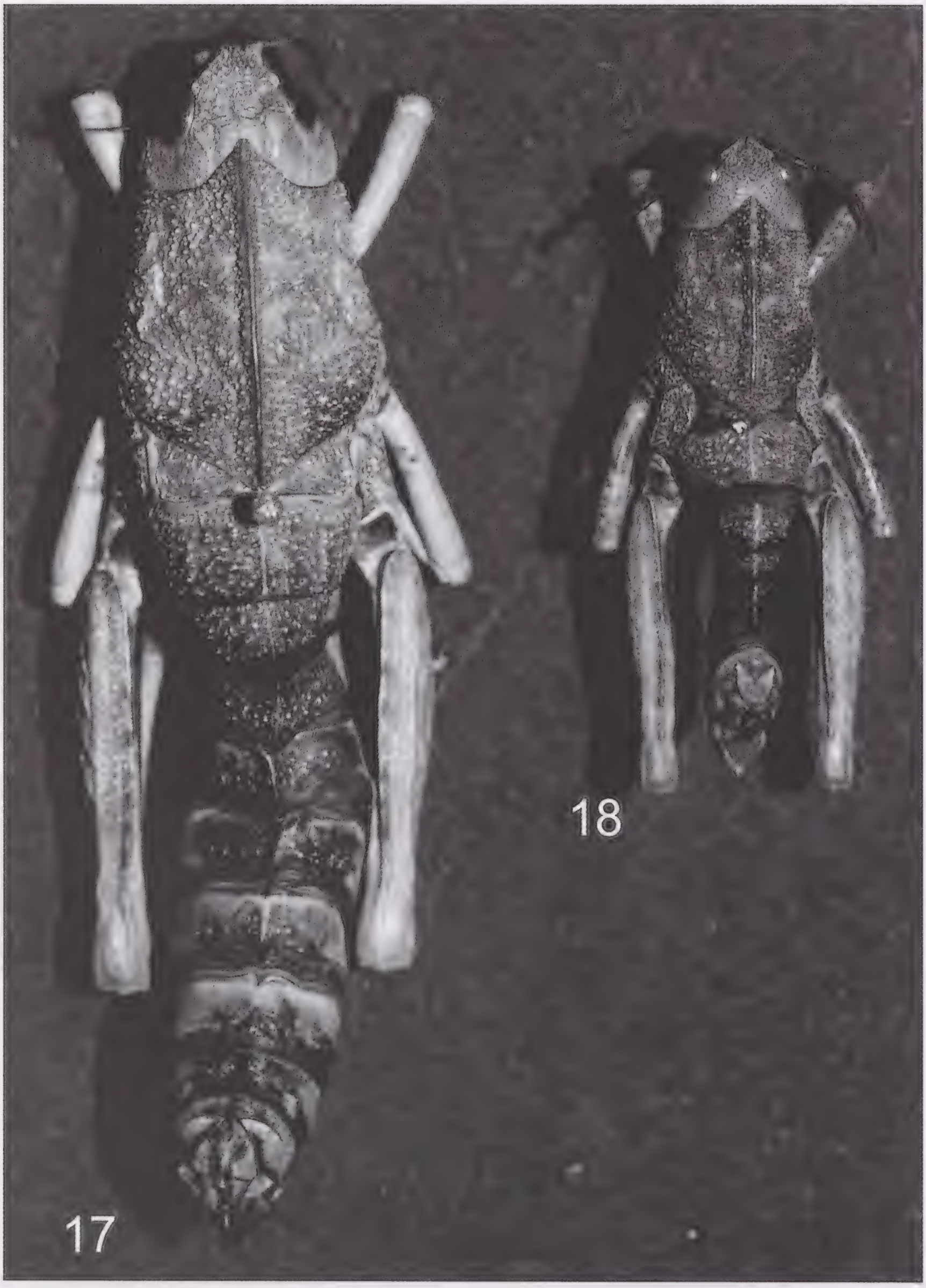
Figs 2-6. *Eremocharis granulosa clavicornis* Ramme, 1939: 2 - male; 3 - female; *Eremopeza bicoloripes* (Morits, 1928): 4 - male; 5 - female; *Dericorys annulata* (Fieber,1853): 6 - female; dorsal view, photo P. Fontana.



Figs 7-11. *Eremocharis granulosa clavicornis* Ramme, 1939: 7 - male; 8 - female; *Eremopeza bicoloripes* (Morits, 1928): 9 - male; 10 - female; *Dericorys annulata* (Fieber,1853): 11 - female; left lateral view, photo P. Fontana.



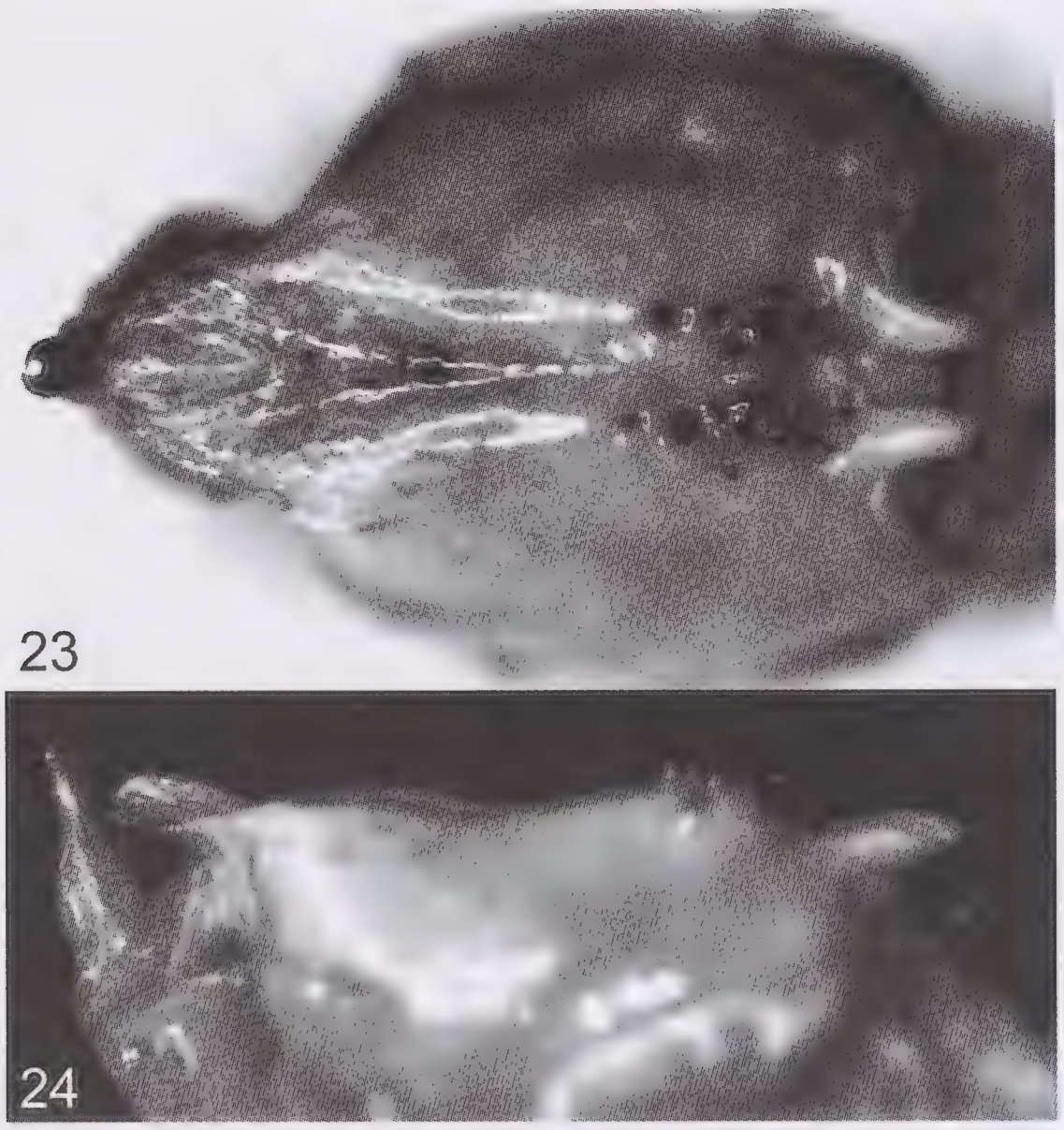
Figs 12-16. *Cryptonothrotes pseudoapterus* La Greca, 2004, male holotype (12), male paratype (13), female allotype (14), female paratypes (15-16); left lateral view, photo P. Fontana.



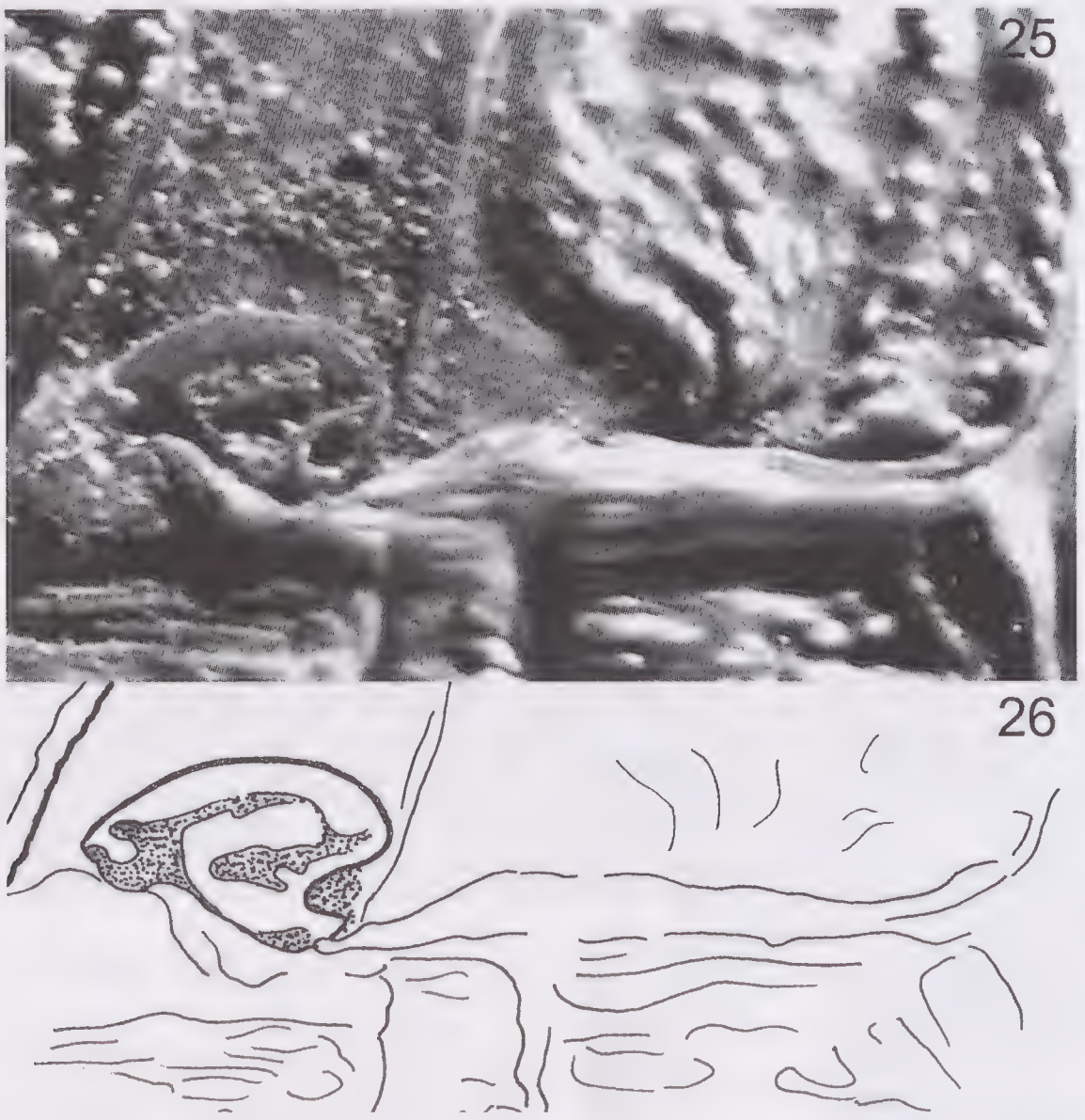
Figs 17-18. *Cryptonothrotes pseudoapterus* La Greca, 2004: 17 - female; 18 - male paratype, from above; photo P. Fontana.

Figs 19-20. *Cryptonothrotes pseudoapterus* La Greca, 2004, male holotype: 19 - abdomen apex from above; 20 - idem, from right lateral view; photo P. Fontana.

Figs 21-22. *Cryptonothrotes pseudoapterus* La Greca, 2004, male holotype: 21 - prosternal process from right lateral view; 22 - left tympanic organ; photo P. Fontana.



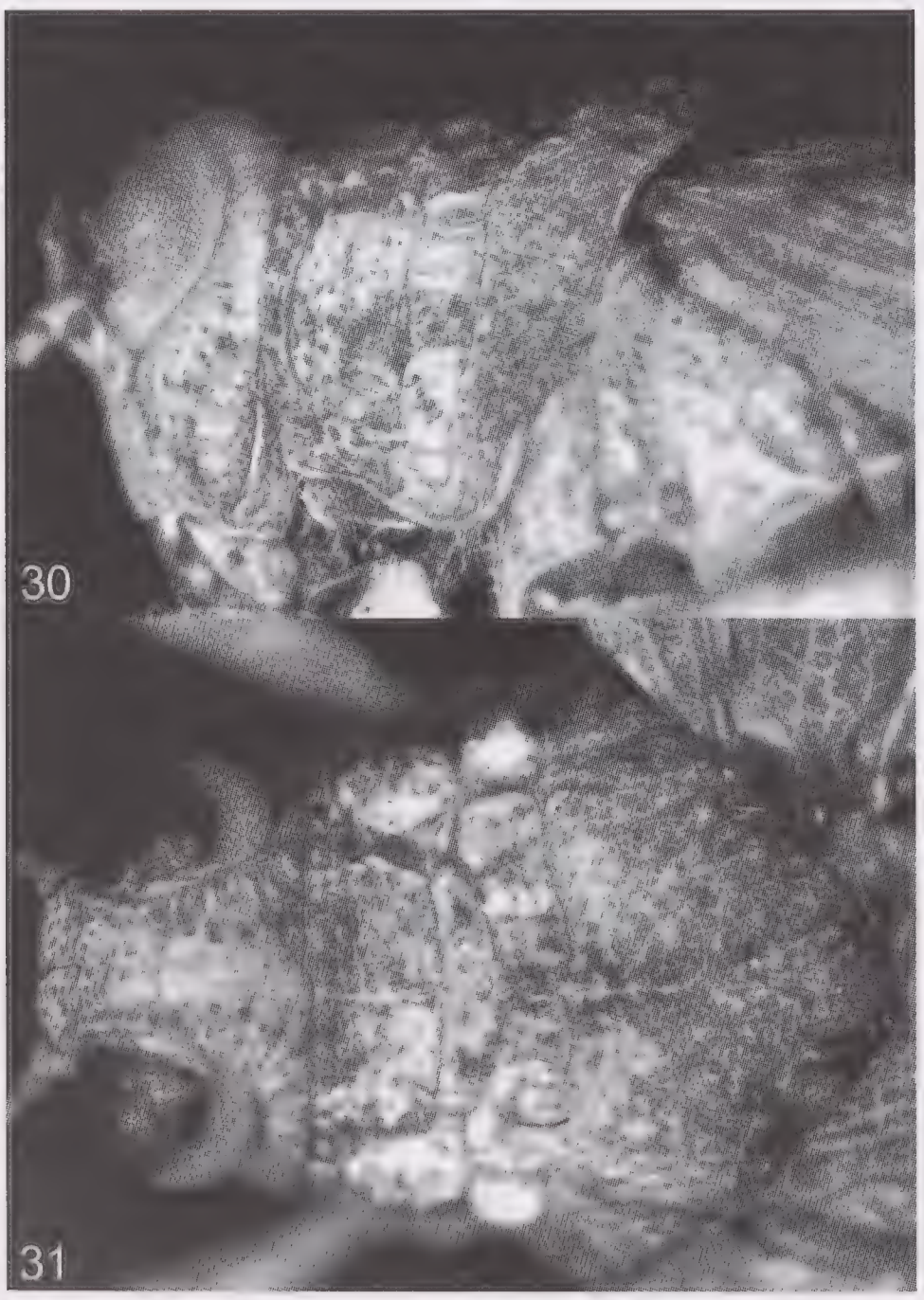
Figs 23-24. *Cryptonothrotes pseudoapterus* La Greca, 2004, male holotype: 23 - phallic complex from above; 24 - idem, right lateral view (24); photo P. Fontana.



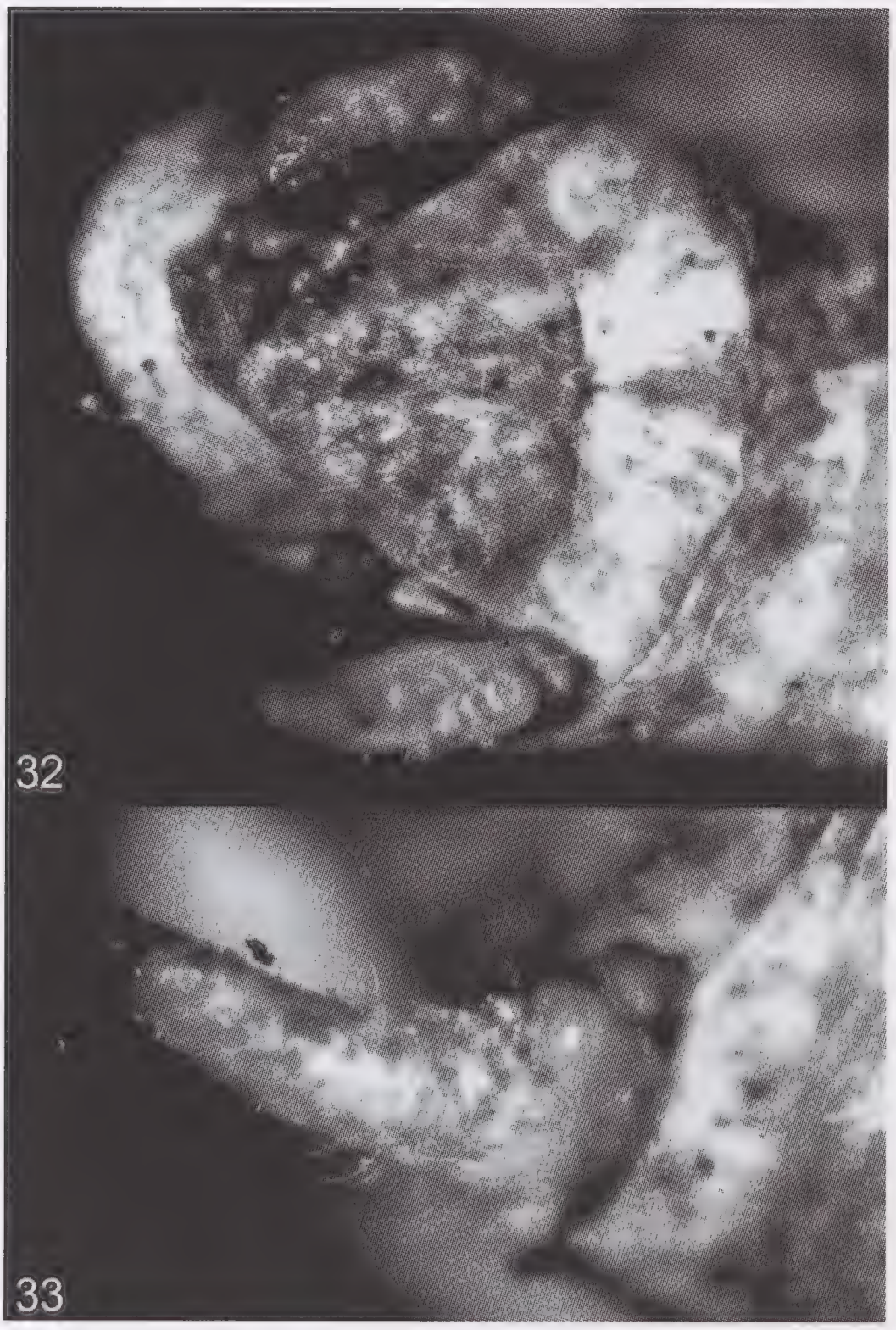
Figs 25-26. *Cryptonothrotes pseudoapterus* La Greca, 2004, female paratype, left wing (pronotum appositely rised); photo and drawing P. Fontana.

Fig. 27. Type localities of *Cryptonothrotes pseudoapterus* La Greca, 2004 (*) and *Iranella simonettai* La Greca, 2004 (**O**).

Figs 28-29. *Iranella simonettai* La Greca, 2004, male holotype: 26 - lateral view; 27 - idem, dorsal view; photo P. Fontana.



Figs 30-31. *Iranella simonettai* La Greca, 2004, male holotype, head and pronotum: 28 - lateral view; 29 - dorsal view; photo P. Fontana.



Figs 32-33. *Iranella simonettai* La Greca, 2004, male holotype: 30 - abdomen apex from above; 31 - right cercus, lateral view; photo P. Fontana.

Fig. 34. *Inanella simonettai* La Greca, 2004, male holotype, sternum, photo P. Fontana.

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Bruno MASSA & Paolo FONTANA

Review of the Middle Eastern Genus *Prionosthenus* (Orthoptera Pamphagidae)

Abstract - The study of material collected in the Middle East consented to re-analyse systematic problems within the gen. *Prionosthenus* Bolivar. Four are considered valid species, that is *P. syriacus* (Brisout, 1855), *P. galericulatus* (Stål, 1876), *P. lebanicus* Dirsh, 1950 and *P. guleni* Karabag, *19*56, while the following are considered belonging to gen. *Ocnerosthenus* Massa: *O. verrucosus* (Brunner, 1882), *O. brunnerianus* (Saussure, 1887), *O. simulans* Bolivar, 1911. They will be treated, together other species of this genus, in another paper. According to available data, *P. syriacus* (Brisout) lives on the high slopes of S Lebanon and N Israel, *P. galericulatus* is present at modest altitudes of C Israel, CN Jordan and SW Lebanon, *P. lebanicus* inhabits Lebanon chain, *P. guleni* a small area of Turkey, S of Antakya. A key to genera *Prionosthenus* and *Ocnerosthenus* and to species of the first genus is proposed.

Riassunto - *Revisione sistematica del genere mediorientale* Prionosthenus *(Orthoptera Pamphagidae).*
L'analisi delle descrizioni originali e l'esame di esemplari provenienti dalle Regioni medio-orientali (Turchia, Siria, Libano, Israele e Giordania) ha consentito di accertare che solo le seguenti specie appartengono al gen. *Prionosthenus* Bolivar: *P. syriacus* (Brisout, 1855) nel nord di Israele e nel sud del Libano, *P. galericulatus* (Stål, 1876) nella fascia centrale di Israele, nella parte centro settentrionale della Giordania e nella parte costiera del Libano meridionale, *P. lebanicus* Dirsh, 1950 nella catena dei monti del Libano, *P. guleni* Karabag, *19*56 in una ristretta area della Turchia a sud di Antakya. Le seguenti specie sono considerate invece appartenenti al Gen. *Ocnerosthenus* Massa: *P. verrucosus* (Brunner, 1882), *P. brunnerianus* (Saussure, 1887), *P. simulans* Bolivar, 1911; esse, insieme con le altre specie di questo genere, saranno trattate in un articolo successivo. Viene infine fornita una chiave per distinguere i due generi e le specie del Gen. *Prionosthenus*.

Key words: Pamphagidae, Prionosthenus, revision, valid species, distribution.

INTRODUCTION

We had the opportunity to examine some interesting material belonging to Pamphagidae, collected in the Middle East; in particular we studied specimens collected in Lebanon by Paolo Brignoli and Valerio Sbordoni in 1972 and preserved in the coll. M. La Greca (Museo Civico di Storia Naturale of Milan), collected in Israel, Lebanon and Turkey, preserved in the British Museum of Natural History, others collected in Israel and Lebanon, preserved in the Naturhistorisches Musem of Vienna, some Turkish specimens sent to B.M. by Petr Kočárek for the identification, material collected by E. Festa in Lebanon, Syria, Jordan and Israel between March and August 1893 (Giglio-Tos, 1893; Festa, 1894), preserved in the Museo Regionale di Scienze Naturali of Turin. Besides, in 1999 and 2000 one of us (BM) carried out some entomological researches in Jordan, collecting some new material. The analysis of these specimens consented us to under-

stand better the identity of some taxa and to revise our opinion published in previous papers (cf. Massa, 1995; Massa & Fontana, 1998); we report here the results regarding the genus *Prionosthenus* Bolivar, 1878.

Before to present our results, we would point out that historical collections hold many specimens generically labelled "Syria", that some well known orthopterists (e.g. Brunner, Saussure, etc.) bought from collectors, who, very probably, labelled them uncorrectly. Furthemore, political frontiers changed very much from the middle 1800 onwards; Syria frontiers in 1855 were rather wider than current ones, and included also the areas of present Jordan, Israel and Lebanon and the western side of Euphrates. We think that very probably some specimens were erroneously or generically labelled (e.g. "Beirut" could mean Syria, including also Palestine) and this produced in the years some misunderstandings; for this reason we will record here only precise localities, omitting specimens generically labelled as collected in "Syria".

ABBREVIATIONS. BMNH = British Museum of Natural History; CMUP = Coll. Massa, University of Palermo; MCSNM = Museo Civico di Storia Naturale of Milan; MHNG = Museum d'Histoire Naturelle of Geneva; MNCNM = Museo Nacional de Ciencias Naturales of Madrid; MNHNP = Musée National d'Histoire Naturelle of Paris; MRSNT = Museo Regionale di Scienze Naturali of Turin; NMW = Naturhistorisches Museum of Vienna.

HISTORICAL NOTES ON THE GENUS *PRIONOSTHENUS* BOLIVAR (TYPE SPECIES *P. GALERICULATUS* (STÅL, 1876))

It belongs to the group of micropterous genera, well diffused in North Africa and Spain, less represented in Italy (Sicily and Sardinia), Greece, Turkey and Middle East. In the latter area the following micropterous genera live: *Prionosthenus* Bolivar, 1878, *Ocneropsis* Uvarov, 1942, *Ocnerosthenus* Massa, 1995 and *Orchamus* Stål, 1876, which inhabits also greek islands. In 1878 Bolivar described, within the genus *Pamphagus* Thunberg, the subgenus *Prionosthenus*, establishing as type species *P. galericulatus* (Stål, 1876) (then known from Tiberias, currently in Israel), and recorded also its presence in Egypt. The subgenus was listed by Brunner (1882), who, following Stål (1876), recognised as *P. galericulatus* specimens depicted in the figure 17 of the plate VII of Savigny (1809-1813). In fact the first image of two specimens (a male paired with a female, showing a very remarkable size dimorphism) of this species was drawn by the scientist Jules de Savigny in the "Déscription de l'Egypte" (1809-1813), and very probably the specimens collected by Savigny came from Palestine, visited by him, when, in 1798-1801, he accompanied the Emperor Napoleon Bonaparte in his campaign in Egypt (Storey, 1918). Buxton & Uvarov (1923) erected *Prionosthenus* to the genus level, still recording *P. galericulatus* from Palestine. In 1942 Uvarov, describing the genus *Ocneropsis*, transferred from *Prionosthenus* Bolivar to it *Pamphagus brunnerianus* Saussure, 1887, *Pamphagus kneuckeri* Krauss, 1909 and *Pamphagus bethlehemita* Bolivar, 1893, leaving within the gen. *Prionosthenus* the following species: *P. galericulatus* (Stål), *P. syriacus* (Brisout, 1855), *P. verrucosus* (Brunner, 1882) and *P. simulans* Bolivar. Nevertheless, a new opinion of Uvarov was reported some years later by Dirsh (1950), that is the on-

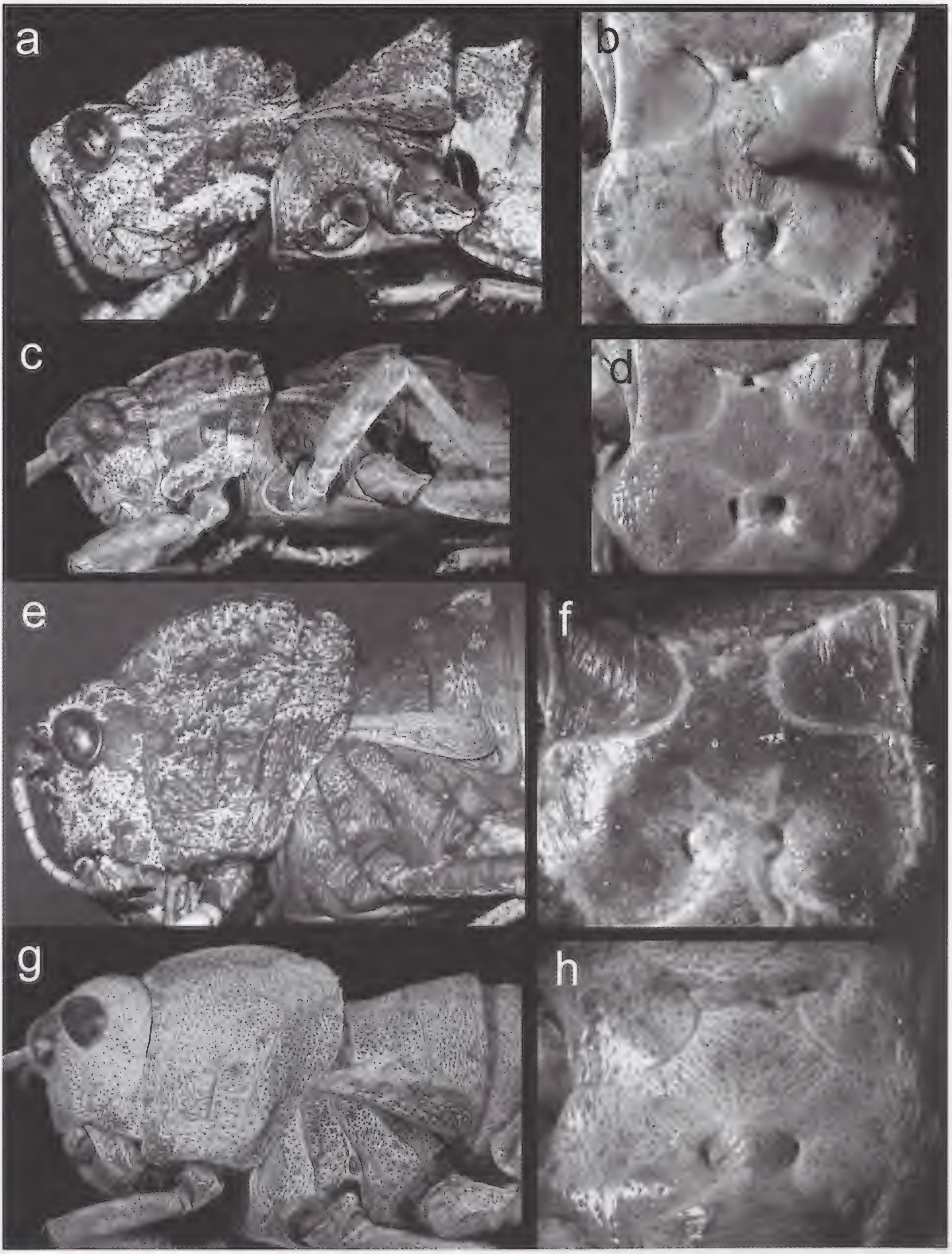
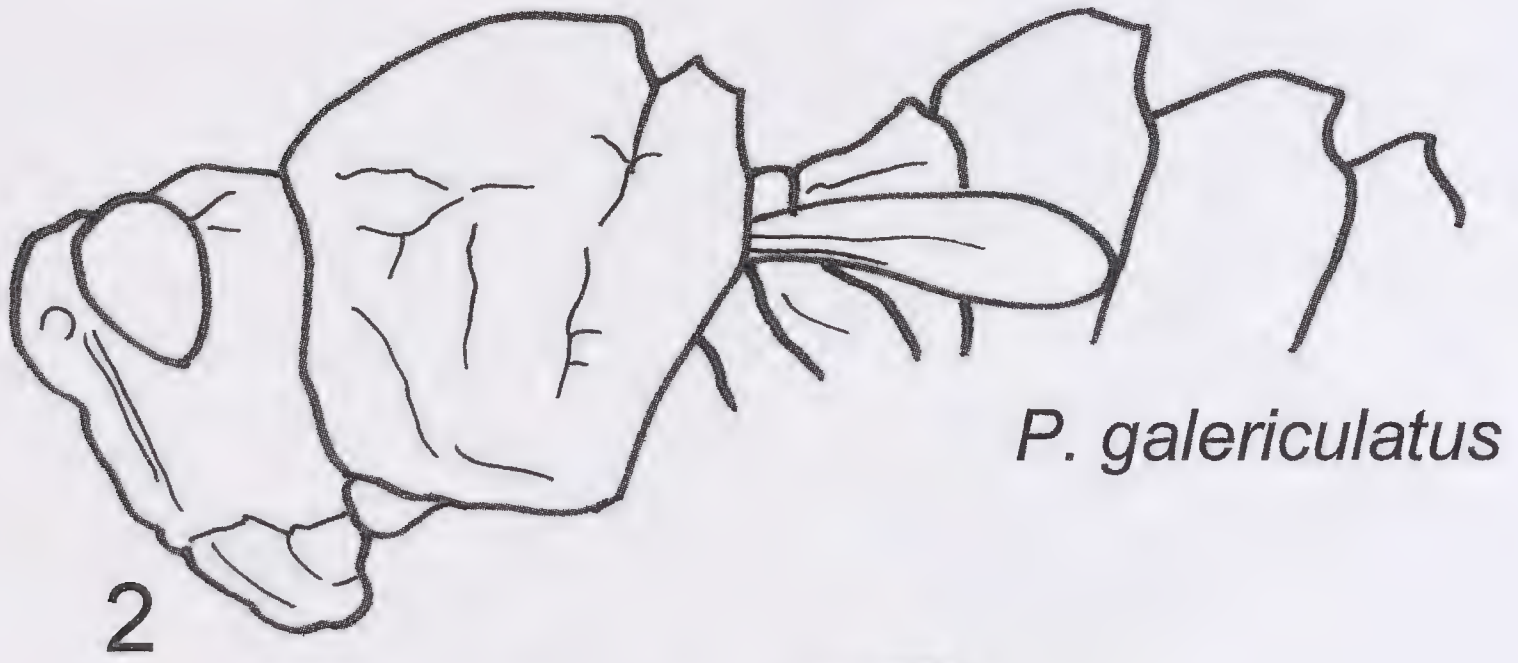
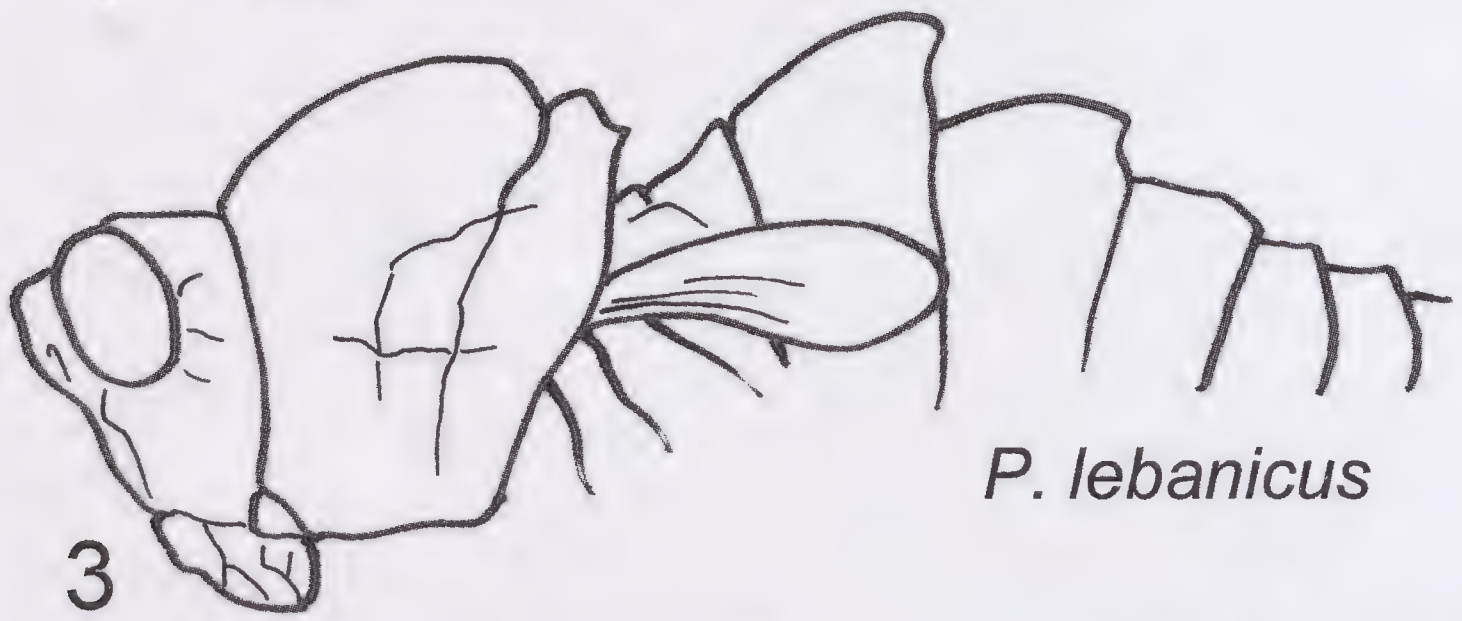
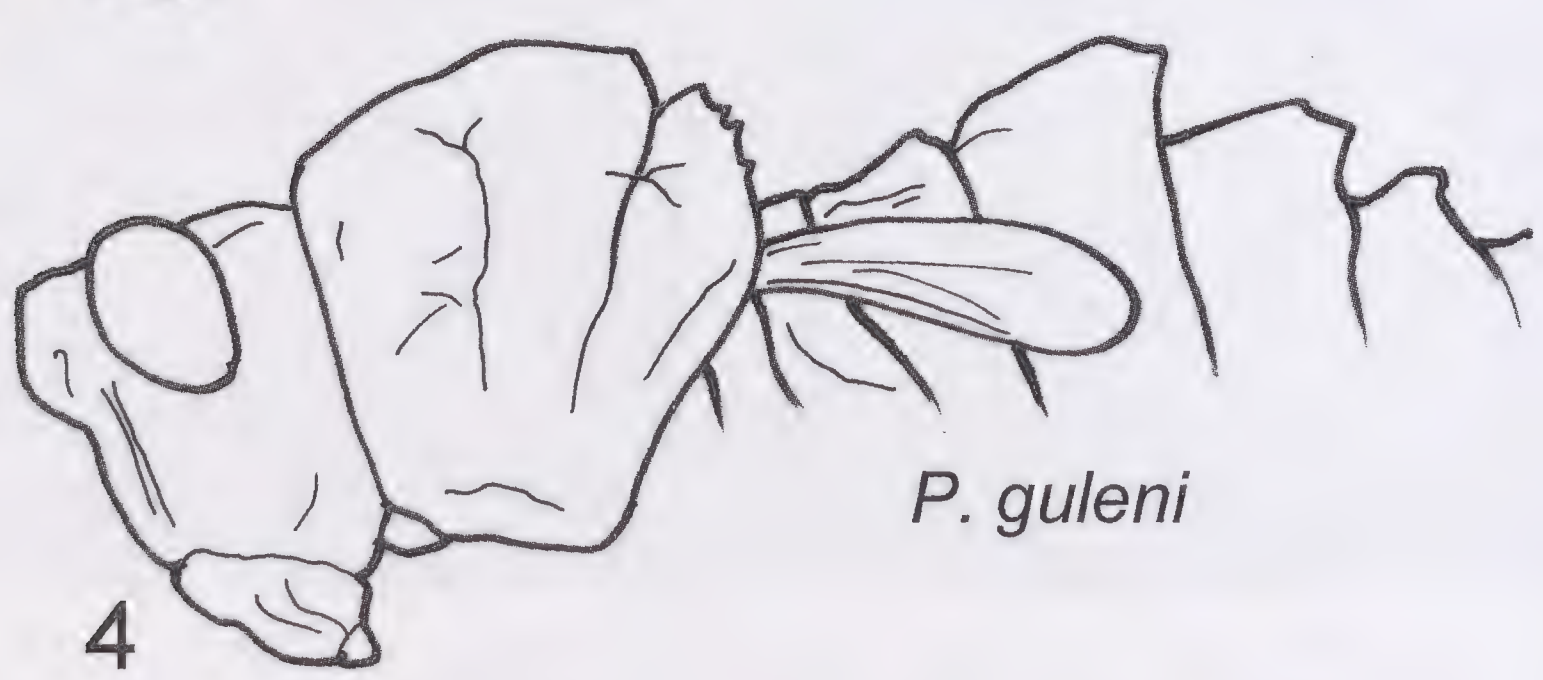


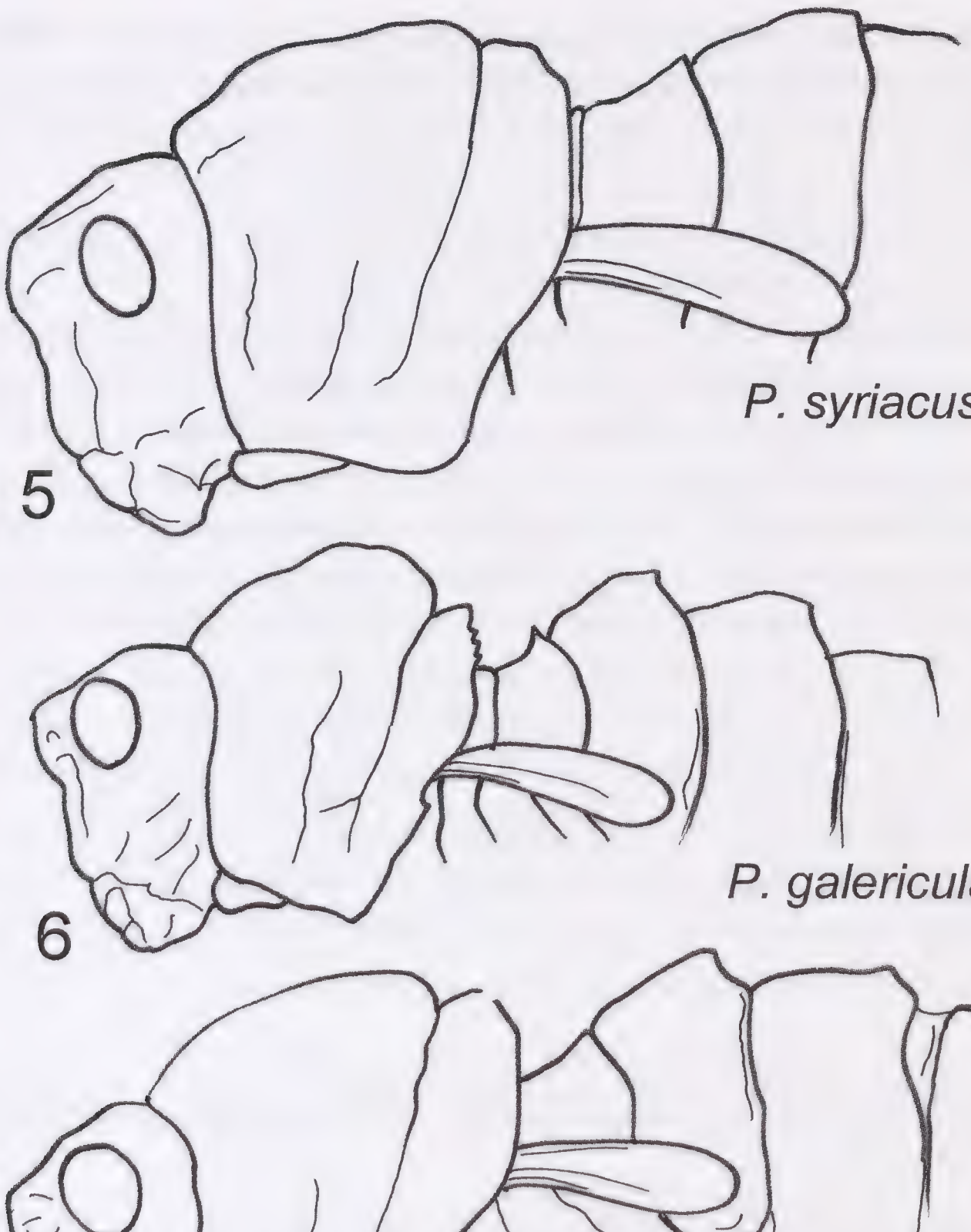
Plate 1. Head, pronotum, metanotum and first abdomen tergites of *Prionosthenus lebanicus* in lateral view (a: male; e: female) and *Ocnerosthenus brunnerianus* (c: male; g: female); meso- and metasternum (b: *P. lebanicus* male; f: female; d: *O. brunnerianus* male; h: female).







Figs 1-4. Lateral view of species belonging to the genus *Prionosthenus* (males): 1 - *P. syriacus* from Mt Hermon; 2 - *P. galericulatus* from Ajlun (Jordan); 3 - *P. lebanicus* from Cedres de Barouk (C Lebanon); 4 - *P. guleni* from Altinosa (Turkey).



Figs 5-8. Lateral view of species of the genus *Prionosthenus* (females): 5 - *P. syriacus* from Mt Hermon; 6 - *P. galericulatus* from Ajlun (Jordan); 7 - *P. lebanicus* from Cedres de Barouk (C Lebanon); 8 - *P. guleni* from Altinosa (Turkey).

ly member of the gen. *Prionosthenus* was *P. galericulatus*, other species belonging to the gen. *Ocneropsis* or to another undescribed genus. Additionally, another two species of *Prionosthenus* were described, respectively, by Dirsh (1950: *P. lebanicus*) and Karabag (1956: *P. guleni*); thus, only three species are listed in the genus by Presa & Garcia (1983). Finally, Massa (1995) established the new genus *Ocnerosthenus*, ascribing to it *Pamphagus kneuckeri* Krauss and *Ocneropsis lividipes* Fishelson, 1985.

On the light of the difficulties to identify the species of the genus *Prionosthenus*, Fishelson (1985) proposed to consider in Israel the presence of just one species (*P. galericulatus*) until its revision. Recently Massa (1995) concluded that five species could be regarded as synonymies of the first cronologically described taxon, *P. syriacus* (Brisout); nevertheless, the scarcity of material did not consent to establish definitely the validity and possible synonymies. This problem has been again considered, briefly, by Massa & Fontana (1998), who have pointed out that there are two forms belonging to the gen. *Prionosthenus*, one characterised by the pronotum keel much raised and the abdomen with an evident keel, another one the males of which showing a modest, not much raised and more or less undulated keel on the pronotum, but not on the abdomen, the females having both the pronotum and the abdomen almost straight, without an evident keel. They, nevertheless, did not reach a definitive conclusion for the first species group, and supposed the synonymy *P. brunnerianus* (Saussure, 1887) = *P. simulans* Bolivar, 1911.

IDENTIFICATION OF THE GENUS *PRIONOSTHENUS* BOLIVAR AND DIFFERENCES FROM THE GENUS *OCNEROSTHENUS* MASSA

Original description of the genus (Bolivar, 1878, Pl. 5: fig. 4): *Pronoto crista alta compressa, sulco postico profunde emarginata; abdomine lobato-cristato; femoribus posticis depressis brevibus; antennis subensiformibus; vertice subhorizontali; corpore granoso.* Characters of the genus are: body compressed laterally, fastigium strongly projecting between antennae, along a line above the upper border of the eye; front more or less vertical; antennal segments flattened at the base, narrowing apically; eyes oval; pronotum more or less raised, posterior transverse sulcus distinct, more in males than in females, close to posterior margin and generally dividing the pronotum in two distinct parts, the anterior being higher than the posterior one; metanotum saddle-shaped and abdominal tergites raised and characterized by a keel, mostly in males, less in females; metasternal interspace narrow, 0.8-1.0 (males) and 1.0-1.1 (females) as wide as long; Krauss's organ smooth, white, brown or black; prosternal process narrow with a bilobate acute anterior apex and two small tubercles backwards; tegmina 2.8-4.6 times as long as wide in males, 3.5-4.7 in females; male subgenital plate in lateral view convex and pointed, transversal sulcus of the plate in the posterior third; postfemora robust, with small teeth in the upper border; phallic complex curved; epyphallus with many spines arranged disorderly. The genus covers CN Israel, N Jordan, Lebanon, NW Syria and S-Turkey; its presence in Egypt (Ihsan & Donskoff, 1988; Massa, 1995) is due to a misunderstanding based on the Table 7 of Savigny (1809-1813).

Table 1 lists characters that consent to tell apart species belonging to genus *Prionosthenus* from those to be ascribed to gen. *Ocnerosthenus*, a related genus that we will treat in a paper to be follow.

Table 1. Characters of *Prionosthenus* and the related genus *Ocnerosthenus*.

	Prionosthenus		*Ocnerosthenus*	
characters	males	females	males	females
Body	Laterally compressed	Laterally compressed	Just laterally compressed	Dorsoventrally depressed
Fastigium	Protruding along the line of the carinula before the eye (Pl. 1a)	Protruding along the line of the carinula before the eye (Pl. 1e)	Sloping forward below the line of the carinula before the eye (Pl. 1c)	Distinctly sloping forward below the line of the carinula before the eye (Pl. 1g)
Pronotum	Much raised, divided by transverse sulcus in two parts, with prozona higher than metazona (Pl. 1a)	Much raised, divided by transverse sulcus in two parts, with prozona just higher than metazona (Pl. 1e)	Less raised, thick, rather sinuous, not clearly divided in two parts, interrupted by the transverse sulcus or two sulci (Pl. 1c)	Less raised, thick, regularly curved, interrupted or not by the transverse sulcus (Pl. 1g)
Metanotum	Saddle shaped (Pl. 1a)	Saddle shaped (Pl. 1e)	Less saddle shaped (Pl. 1c)	Not or just saddle shaped (Pl. 1g)
Abdomen keel	Much evident, higher than pronotum (Pl. 1a)	Evident, higher than pronotum (Pl. 1e)	Less evident, as high as pronotum; only first tergites with small spines (Pl. 1c)	Generally absent, first tergites unarmed, as high or lower than pronotum (Pl. 1g)
Mesosternal space (width/length)	0.8-1.0 (Pl. 1b)	1.0-1.1 (Pl. 1f)	1.2-1.6 (Pl. 1d)	1.4-1.8 (Pl. 1h)

On the basis of these characters we propose here to transfer to the genus *Ocnerosthenus* the following species.

Pamphagus verrucosus Brunner, 1882, Prodr. Eur. Orth.: 187.

We examined the type (female) (NMW), finding that, differently from what reported by Massa (1995), it does not belong to the gen. *Prionosthenus*, but to the gen. *Ocnerosthenus*. Characteristics of the specimen are the following: body dorsoventrally compressed, fastigium in lateral view evidently sloping between antennae, pronotum little compressed laterally, median keel thick, raised and interrupted by the sulcus (differently from what reported by Brunner, 1882), abdominal keel not evident, tergites lower than pronotum, ratio between width and length of mesosternal space c. 1.5.

Pamphagus brunnerianus Saussure, 1887, Spicil. Ent., 2: 75

Characters of specimens examined consent definitely to establish that this taxon does not belong to the gen. *Prionosthenus*, but to *Ocnerosthenus*. We examined one of

syntypi, male, Djebel Akra [= Mt Cassius], 6.85, N-Syrien, F. Leuthner (corresponding perfectly to the male drawn by Saussure) (MHNG), finding the following characters: body just laterally compressed, fastigium in lateral view sloping forward below the line of the carinula before the eye, pronotum just raised, thick, interrupted by the transverse sulcus, only first tergites bearing small spines, abdomen tergites as high as pronotum, ratio between width and length of mesosternal space 1.2.

Other syntypi are labelled as follows: 1) Ladikve (= Lattakia or Ladakia), 5.1885, N-Syrien, F. Leuthner; 2) Syrie sept., Brunner d. W.; Females: 3) Syrie sept., Brunner d. W.; 4) Syrie sept., Brunner d. W.; 5) without locality data; 6) Syrie, Armenia, Leuthner: P. Schwendinger provided us with some good photos of this specimen, showing the typical characteristics of the females of the genus *Ocnerosthenus* (fastigium sloping forward below the eye border, pronotum with median keel regularly curved, not interrupted by transversal sulcus, abdominal keel absent, abdomen tergites lower than pronotum). Other specimens that we examined (3 ♂ ♂ and 3 ♀ ♀), which were certainly part of the same series (Ladakia, 5.1885, Leuthner) (NMW), show the characters above listed.

Prionosthenus simulans Bolivar, 1911, Bull. Soc. Rouen, 47: 37.

We did not examine the type male (MNCNM), but we dispose of a drawing performed by V. Llorente, published by Massa (1995); moreover, we examined a topotypic series (Lebanon, Bcharré, Cedars thicket 12-19.VI.31, 2 ♂ ♂, 11 ♀ ♀) (NMW), which shows the typical characters of the genus *Ocnerosthenus*, that is: body just laterally compressed in the males, dorsoventrally compressed in the females, fastigium in lateral view sloping forward below the line of the carinula before the eye, pronotum just raised, thick, interrupted by the transverse sulcus, only first tergites bearing small spines in the males, median keel absent in the females, ratio between width and length of mesosternal space 1.3 in the males, 1.7 in the females.

DISCUSSION

Prionosthenus syriacus (Brisout, 1855)

Acridium syriacum, Brisout, 1855, Ann. Soc. Ent. France, 3: LXXIII.
Pamphagus verrucosus, Brunner, 1882, Prodr. Eur. Orth.: 187.
Pamphagus galericulatus, Giglio Tos, 1893. Boll. Mus. Zool. Anat. comp. R. Univ. Torino, 8 (164): 7 (partim).
Euryparyphes syriacus, Jacobson, 1902. In Jacobson & Bianchi. Orth. Russ. Reiches: 200, 297.
Euryparyphes syriacus, Kirby, 1910. Synonymic Catalogue of Orthoptera. 3 (2): 353.
Prionosthenus syriacus, Bodenheimer, 1935. Archiv. Naturgeschichte, 4: 200.
Ocneropsis syriacus, Dirsh, 1950. Eos. 26: 68.
Ocneropsis syriacus, Presa & Garcia, 1983. Ann. Univ. Murcia, 42: 19.
Ocneropsis syriacus, Ihsan & Donskoff, 1988. Bull. Soc. entom. France. 93 (1-2) : 20.
Ocneropsis syriacus, Otte, 1994. Orthoptera Species File, 3: 177 (partim).
Prionosthenus syriacus, Massa, 1995. Naturalista sicil., 19 (1-2): 106.
Prionosthenus syriacus, Massa & Fontana, 1998. Boll. Mus. civ. St. nat. Verona, 22: 74.

TYPE-LOCALITY. Syria (only the female described).

TYPE MATERIAL: lost. We establish the neotypus, as follows: male, S Lebanon, Mt Hermon, June 1893, E. Festa (MRSNT).

MATERIAL EXAMINED: N Israel and S Lebanon, Mt Hermon, June 1893, E. Festa (8 ♂ ♂, 11 ♀ ♀, 6 nymphs) (MRSNT); Mt Hermon 6.VI.45 (3 ♀ ♀) (BMNH).

DISTRIBUTION. It inhabits the mountains of N Israel and S Lebanon, from c. 1000 to 2000 m a.s.l. (fig. 17).

ORIGINAL DESCRIPTION (Brisout, 1855). Tête très grosse, rugueuse, à front avancée entre les antennes, à face antérieure presentant une profonde dépression transversale vers l'ocelle médian; carènes du vertex très prononcées. Yeux grands. Antennes grosses, comprimées, subprismatiques. Prothorax rugueux, couvert de petits tubercles et de granules, tectiforme-caréné, à carène dorsale et médiane assez élevée, arquée, à carènes latérales bien moins saillantes; bord postérieur du prothorax un peu denticulé, largement échancré vis à vis de la termination de la carène dorsale... Abdomen caréné en dessus. Elytres...oblongues, très étroites... Jambes postérieures courtes, fortes, un demi-anneau noir inférieurement à la base, leur coté grisâtre, leur coté interne violacé.

P. syriacus is a large and stout species (table 2), not much laterally compressed; the pronotum shows a raised prozona, in the male remarkably separated by the transverse sulcus from the metazona, which is as high as the prozona (fig. 1); in the females the pronotum is regularly curved, raised and interrupted by the transverse sulcus (fig. 6). The metanotum is saddle-shaped and the first 3-4 abdominal segments, both in the male and in the female, are clearly raised and laterally compressed. Phallic complex from lateral view shows the sclerites apex very stout and short (fig. 9); these, from back view, are long, with pointed apices (fig. 13).

Massa (1995), pointing out that the original description of the female consents to ascribe this species to the gen. *Prionosthenus*, considered impossible to locate the geographical origin of the type. Nevertheless, characteristics of the females collected in Mt. Hermon (S Lebanon and N Israel) fit rather well Brisout' description and consequently we reasonably consider *P. syriacus* all the specimens coming from this geographic area, listed by Giglio-Tos (1893) *sub P. galericulatus*. The other specimens listed by Giglio-Tos (1893), collected at Ferzol, Souk Wadi Barada (1500 m), Zebedani (1700-2000 m), Merdsch Ain and Jamuneh (Lebanon), actually belong to the taxon *Ocnerosthenus kneuckeri* Krauss (Massa, 1995). Dirsh (1950), who considered the taxon *syriacus* belonging to the gen. *Ocneropsis*, reported specimens from Jebel Mazar, Mt Cassius (NW Syria) and Mt Hermon; we believe that these specimens have to be currently considered as different species of the gen. *Ocnerosthenus*.

Prionosthenus galericulatus (Stål, 1876)

Pamphagus galericulatus Stål, 1876, K. Svenska Vetensk Akad. Handl., 4 (5): 28).
Pamphagus galericulatus, Kirby, 1910. Synonymic Catalogue of Orthoptera. 3 (2): 349.
Prionosthenus galericulatus, Bodenheimer, 1935. Archiv. Naturgeschichte, 4: 199.
Prionosthenus galericulatus, Dirsh, 1950. Eos. 26: 65.
Prionosthenus galericulatus, Presa & Garcia, 1983. Ann. Univ. Murcia, 42: 27.

Prionosthenus galericulatus, Fishelson, 1985. Fauna Palaestina. Orthoptera Acridoidea: 95.
Prionosthenus galericulatus, Ihsan & Donskoff, 1988. Bull. Soc. entom. France. 93 (1-2): 18.
Prionosthenus syriacus, Otte, 1994. Orthoptera Species File, 3: 193 (partim).
Prionosthenus syriacus, Massa, 1995. Naturalista sicil., 19 (1-2): 108 (partim).

TYPE-LOCALITY. Tiberias (Israel).

TYPE MATERIAL: Naturhistorisches Riksmuseum Stockholm.

MATERIAL EXAMINED: Israel, Jerusalem 25.IV.64 (1♂, 1♀) (Coll. Niedl, MRSNT); Eshatzol (5 Km N Beit Shemesh) 11-17.V.67 (1♂, 1♀) (Coll. La Greca, MCSNM); Bethlehem 5.VII.28 (1♀) (NMW); Mt. Carmel 21.V.20 (1♂, 1♀); Nahres Zevka Coastal zone 14.IV.23 (1♂, 2♀♀); Galilee Wadi Hamman 1.IV.22 (1♀); Nazareth 11.V.21 (1♀), 15.VI.23 (1♀); Jerusalem 15.IV.22 (1♀), 11.V.22 (1♀), 18.IV.53 (1♂), 27.IV.53 (3♂♂, 2♀♀), 8.V.53 (1♂, 1♀), 10.V.53 (1♂), 14.V.53 (1♀), 2.IV.58 (1♀), 25.IV.73 (1♂); Tabagha, Tiberias 6.IV.22 (2♀♀); Palestine (1♂); Carmel, Place of Sacrifice 1.I.30 (1♀), 1.III.30 (1♀), 4.III.30 (3♂♂), 3.IV.30 (1♀); Lake Hula 10.V.45 (♀), 8.IV.43 (1♀); Mazuvz 18.III.51 (1♀); Degania 8.IV.45 (1♂, 13 nymphs), 9.IV.45 (3♀♀); Fermaq 16.IV.63 (1♂) (BMNH); Jordan, Knor Fasayil 10.IV.51 (1♂, 1♀) (BMNH); Ajlun 24.V.99 (4♂♂); Judayta 29.IV.00 (2♂♂, 5♀♀); As Salt 22.IV.00 (2♂♂, 1♀); Ash Shuna 30.IV.00 (1♂) (CMUP). Lebanon: Beyruth (7♂♂, 6♀♀) (NMW); Beyruth IV.1885 (3♂♂, 3♀♀) S. Damour 10.IV.69 (1♂, 13 numphs) (MNHNP); Beyruth (1♂, 1♀) (MNCNM).

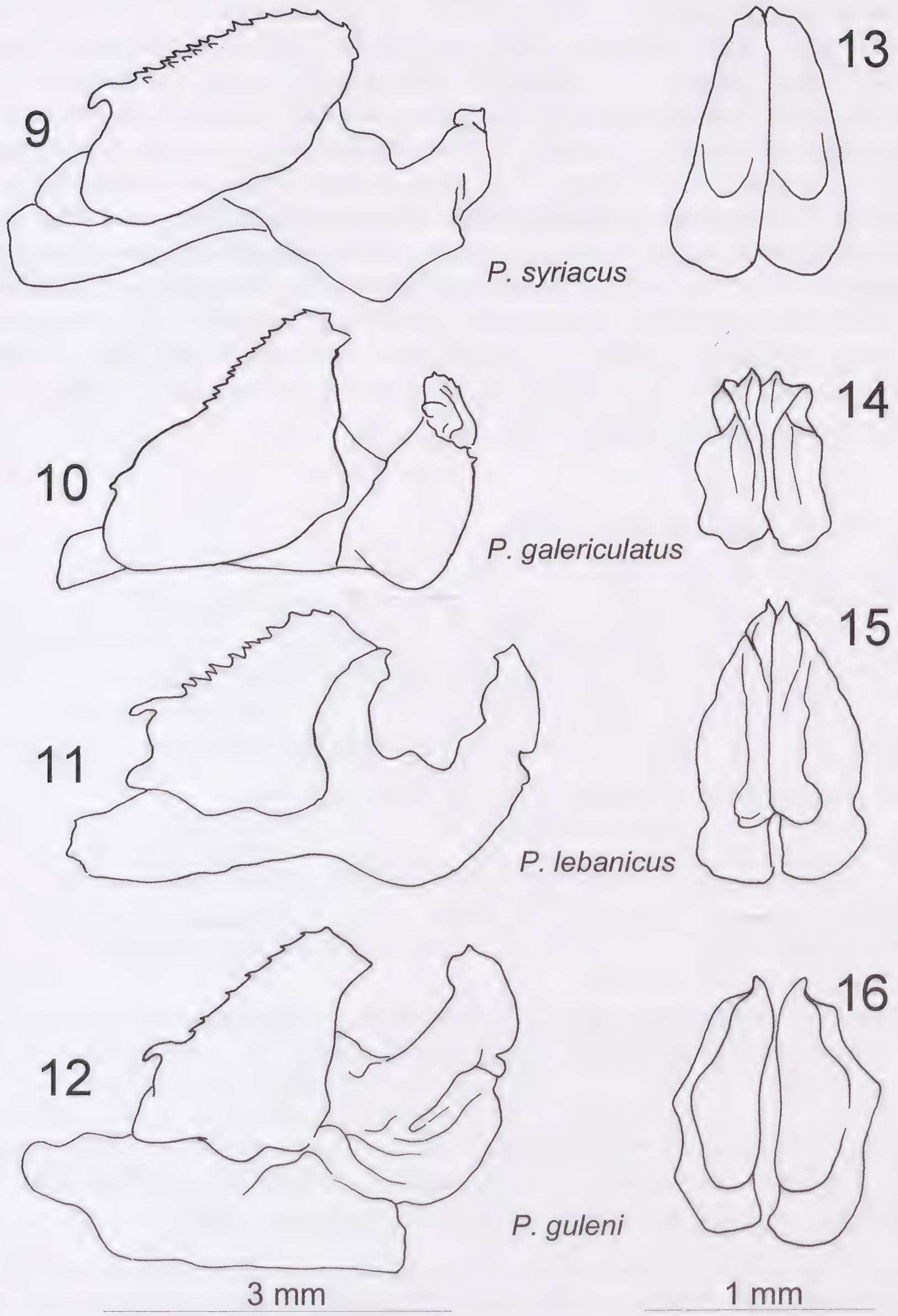
DISTRIBUTION. It inhabits modest altitudes of N Jordan, CN Israel and SW Lebanon (fig. 17).

NOTE. The specimens of NMW bearing Beyruth labels were presented to Brunner van Wattenwyl by Julius Lederer (1801-1870), who did not visit Middle East (Horne et al., 1990) but acquired them from another collector, Mr Godl. The analysis of body characters and the examen of phallic complex let us to confirm that they belong to this species, as the other specimens collected at Beyruth and preserved at MNHNP and MNCNM.

ORIGINAL DESCRIPTION (Stål, 1876): Lobus anticus pronoti crista alta, retrorsum altiore, postice subito declivi instructus, crista lobi postici retrorsum sensim tringulariter elevata; segmenta dorsalia abdominis lobato-cristata, cristae segmentorum anteriorum maximae; antennae subensiformes; caput et pronotum dense, dorsum abdominis remote granulata; fastigium verticis subhorizontale… (= Descr. de l'Egypte, Zool. Orth. Pl. 7 f. 17).

P. galericulatus is the smallest species of the genus (table 2), with the body very much compressed laterally; the frons is projecting forward between the antennae, straightening below median ocellus; the fastigium has evident lateral carinae. Pronotum with median keel raised, arc-like; posterior transverse sulcus distinct, situated close to the posterior margin, forming a short metazona, remarkably lower than prozona. The metanotum is saddle-shaped and the abdominal tergites are compressed laterally, forming a row of sharp protrusions along the dorsum (fig. 2), less evident in the female (fig. 6). Phallic complex in lateral view similar to that of *P. syriacus* (fig. 10), but aedeagus sclerites, from back view, are very short and stout (fig. 14). These characters, differently from what previously reported by Massa (1995) and Massa & Fontana (1998), consent to consider *P. galericulatus* as a valid species.

Among the specimens reported by Giglio-Tos (1893) as *P. galericulatus*, those collected at Es-Salt (Jordan) seem to be the only ones really belonging to this species.



Figs 9-12. Lateral view of the phallic complex of species of the genus *Prionosthenus*: 9 - *P. syriacus* from Mt Hermon; 10 - *P. galericulatus* from Ajlun (Jordan); 11 - *P. lebanicus* from Cedres de Barouk (C Lebanon); 12 - *P. guleni* from Atay (Turkey).
Figs 13-16. Back view of aedeagus sclerites of species of the genus *Prionosthenus*: 13 - *P. syriacus* from Mt Hermon; 14 - *P. galericulatus* from Ajlun (Jordan); 15 - *P. lebanicus* from Cedres de Barouk (C Lebanon); 16 - *P. guleni* from Atay (Turkey).

Bodenheimer (1935) quotes the following Palestinian localities: Tiberias, As Salt, Jerulasem, Tabgha, Wadi Hammam, Nahr es Zerka, Merj Sanor, Artuf, Akko, Nazareth, Karmel, Migdal, Metulla (this locality is possibly inhabited by *P. syriacus*), Tel Chaj, Emek, Ben Schemen, Nagingad, Kirjath, Anavim, Nahalal, Beit Djemal, Ain Charod, Gan Schmuel, Chedera Bo. Dirsh (1950) recorded it from Lake Hula and Degania (Israel) and Mt Cassius (= Dj. Akra, NW Syria); we believe that the latter locality could be inhabited by *P. guleni*. Fishelson (1985) records it from Upper and Lower Galilee, Carmel, Jordan Valley, Judean Hills and Desert (CN Israel) and Katbeh Bader (2001) lists the following collecting localities of N Jordan: Ajlun, Al Jubayhah, As Salt, Humrat As Sahen, Muzayrib, Rajib, Az Zaherah (Irbid), Wadi Shu'ayb. Finally, Massa (1995) quotes some specimens, labelled as *P. galericulatus*, preserved at MNCNM, coming from Israel (Jerusalem and Jarmaq = Atzmon), Syria and Lebanon (Beirut). Syrian specimens could be a case of labelling inaccuracy.

Prionosthenus lebanicus Dirsh, 1950

Prionosthenus lebanicus Dirsh, 1950, Eos, 26: 65.
Prionosthenus lebanicus, Presa & Garcia, 1983. Ann. Univ. Murcia, 42: 27.
Prionosthenus lebanicus, Ihsan & Donskoff, 1988. Bull. Soc. entom. France. 93 (1-2): 18.
Prionosthenus lebanicus, Otte, 1994. Orthoptera Species File, 3: 193.
Prionosthenus lebanicus, Massa, 1995. Naturalista sicil., 19 (1-2): 112.

TYPE-LOCALITY. Aley (= Aleih) (Lebanon) (described only the male).

TYPE MATERIAL: British Museum of Natural History, London.

MATERIAL EXAMINED: CS Lebanon, Aleih (1 ♂) (Coll. Festa, MRSNT); Djebel Kesrouane, 2000 m, 26.V.72 (1 ♂); Cedres de Barouk, 23-25.V.72 (1 ♂, 2 ♀ ♀); Bekaa, IV.62 (1 ♀) (Coll. La Greca, MCSNM); Libaah (1 ♀); Beyruth (1 ♀) (NMW); Barouk Cedars, 1600 m, 14-16.VI.33 (6 ♂ ♂, 17 ♀ ♀); Ain Zhaite Cedars, 1700 m (2 ♀ ♀); Hasbaya 22.VI.45 (1 ♀); Zahlé 11.IV.17 (1 ♂, 1 ♀); Ablah 25.X[sic].45 (1 ♂) (BMNH).

DISTRIBUTION. It is probably distributed only in the CS Lebanon, on the Lebanon chain, between Bekaa, the Djebel Kesrouane and the Djebel Barouk, and on hills above Beirut and above Sidon.

NOTE. All the species of *Prionosthenus* may be found as adults since the early spring to June-July; the collecting date of the specimen from Ablah (25 October 1945), above listed, is the only record so much late and may be a *lapsus calami*.

ORIGINAL DESCRIPTION (Dirsh, 1950): Frontal ridge strongly projecting forwards, strongly compressed... Fastigium of vertex elongate, concave, limited by sinuate, sharp, lateral carinulae... Antennae 13-segmented, shorter than head and pronotum together, thick and compressed... median carina high, strongly convex, laterally compressed, deeply and broadly dissected by third transverse sulcus... Upper margin of metanotum, in profile, irregularly curved, with a tooth shaped projection on the posterior margin... Abdomen strongly carinate... Mesosternal interspace as long as broad... Metasternal interspace twice as wide as long... Hind tibia above grey, inside grey-blue.

P. lebanicus is a large species, similar in size to *P. syriacus* and *P. guleni*; the prono-

tum shape is similar to that of *P. syriacus*, but in *P. lebanicus*, even if prozona and metazona are generally sharply interrupted by the transverse sulcus, the incision between the two areas is not as large as in *P. syriacus* (figs. 3 and 7) and in some females is lacking. The first 4-5 abdominal segments show apical protrusions similar to those of *P. syriacus*. Phallic complex, in lateral view, has long sclerites (fig. 11); these, from back view, are stout (fig. 15).

When Dirsh (1950) described the male of this species, compared it with other two taxa that he considered belonging to the genus *Prionosthenus*, that is *galericulatus* and *brunnerianus*, but not with *P. syriacus*, considered by him an *Ocneropsis*. Massa (1995), on the basis of a topotypic male from Aleih, recorded by Giglio-Tos (1893) as *P. verrucosus*, preserved at MRSNT, which exhibits the same characteristics and the general *habitus* of *P. syriacus*, concluded that *P. lebanicus* could be regarded as synonym of *P. syriacus*. Further material now examined consents us to establish that *P. lebanicus* is a valid species, well related to *P. syriacus*.

Prionosthenus guleni Karabag, 1956

Prionosthenus guleni Karabag, 1956, Eos, 32: 128.
Prionosthenus guleni, Presa & Garcia, 1983. Ann. Univ. Murcia, 42: 27.
Prionosthenus guleni, Otte, 1994. Orthoptera Species File, 3: 193.
Prionosthenus gueleni, Demirsoy, 1973. Ent. Mitt. Zool. Mus. Hamburg, 83: 427.
Prionosthenus guleni, Naskrecki & Unal, 1995. Beitr. Ent., 45: 408.
Prionosthenus guleni, Massa, 1995. Naturalista sicil., 19 (1-2): 112.

TYPE-LOCALITY: Yayladagi-Hirsarcik (Hatay province, Turkey).

TYPE MATERIAL: British Museum of Natural History, London.

MATERIAL EXAMINED: TURKEY, Altinosa 23.IV.92 (2♂♂, 2♀♀) (CMUP); Hatay 14.VI.60 (3♂♂, 3♀♀) (BMNH).

ORIGINAL DESCRIPTION (Karabag, 1956): Antennae almost filiform... Fastigium of vertex elongate, pentagonal, apex triangular... Pronotum relatively short... median carina raised strongly and laterally compressed: its highest point being behind the middle... posterior margin with several strong spines... median carina of metanotum posteriorly raised and laterally compressed... First and second tergites with a strongly laterally compressed median carina; median carina on other tergites raised strongly and spined... hind tibia on the inside red, its upper surface pinkish-violet.

Additional characters. It is the largest species (tab. 2); the pronotum is clearly divided in two parts by transverse sulcus in the male, less in the female; the saddle in the metanotum and protrusions in the abdominal tergites are evident, mostly in the male (figs. 4, 8). Phallic complex long, stout and pimply (fig. 12); aedeagus sclerites characterized by pointed apices (fig. 16). It is known only for the Hatay province (cf. also Demirsoy, 1973; Naskrecki & Unal, 1995), which is located in south-eastern Turkey near the Mediterranean border with Syria. Dirsh (1950) recorded one female of *P. galericulatus* from Mt Cassius (= Dj. Akra, NW Syria); being this locality next to the Turkey frontier, it is possible that this specimen belongs to *P. guleni*.

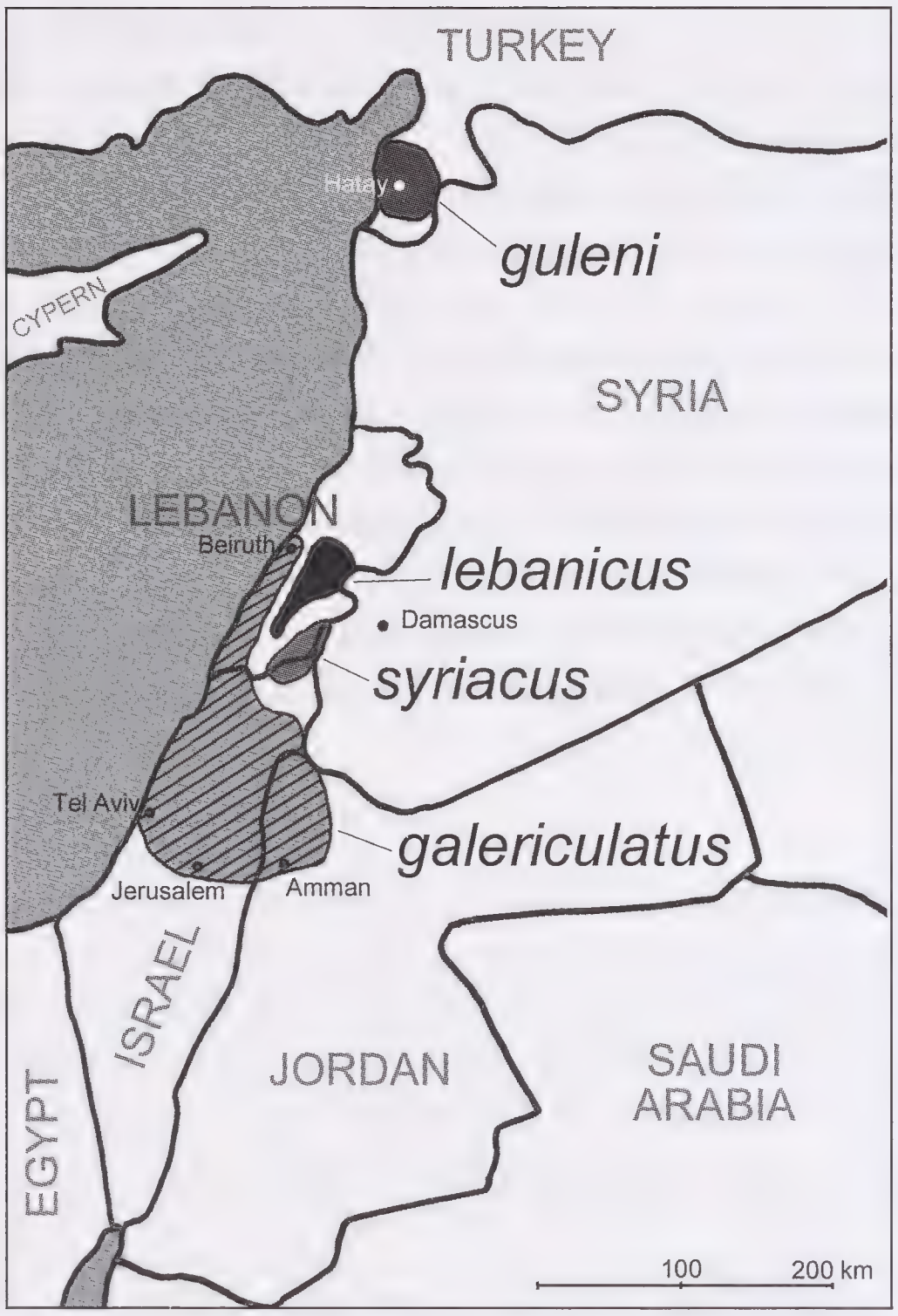


Fig. 17. Distribution of the valid species of the genus *Prionosthenus*.

BIOGEOGRAPHICAL CONSIDERATIONS ON THE DISTRIBUTION OF THE GEN. *PRIONOSTHENUS*

Differently from the provisional conclusions of Massa (1995) and Massa & Fontana (1998), the genus *Prionosthenus* consists of four species, *P. syriacus* (Brisout, 1855), *P. galericulatus* (Stål, 1876), *P. lebanicus* Dirsh, 1950 and *P. guleni* Karabag, 1956. They live in mountainous areas, from c. 500 to 2000 m a.s.l.; adults are found in spring (March-July), while neanids appear at the beginning of winter, after the first rains. Their distribution covers the mountainous chains located along North-South direction from Syria and Turkey to Lebanon, North-central Israel and North Jordan; we may assume that the species presently known are relicts of several populations, which were separated under quite different climatic conditions, facing only small changes of their phenotypes.

The zoogeographical and evolutionary importance of the Middle East as a transition area between Palearctic, Afrotropical and Oriental realms, has been pointed out by different biogeographers, but up to now it has not received the necessary attention. The establishment of the Miocene Middle Eastern landbridge permitted a great faunal interchange between Eurasia and Africa; the whole region was affected by a progressive dessication which created an ecological barrier between the boreal Euro-Sibirian species

to the north and the Afrotropical and Oriental species to the south, but it also produced a high degree of specialized endemic taxa. Across this landbridge African species invaded the eastern Mediterranean and penetrated into Asia and, viceversa, Asiatic species expanded to South-West, colonizing Mediterranean coasts (Fishelson, 1985). Two symmetrical extensive mountainous formations, placed over c. 1000 Km along the North-South direction from the southern border of Turkey to Sinai, took place within the formerly flat and dry eremic belt during the transition from the Tertiary to the Quaternary; they are separated by a longitudinal depression, where in the opposite directions Oronte and Jordan rivers flow (Wolfart, 1987). On the West side, from North to South, there are the following mountains: Taurus and Amanus (Mediterranean Anatolia, Turkey, 2282 m), Ansariya (Syria, 1562 m), Lebanon range (3083 m), Galilee and Judean Mts (Israel, 1200-1300 m); and on the East side the parallel chain: Djebel Esh Shargi (= Antilebanon range, 2659 m, between Lebanon and Syria), Hermon (2814 m) (Israel, Lebanon and Syria), Djebel Ajlun (1261 m), Northern Highlands (1247 m), Aqaba Mts (1754 m) (Jordan) and Djebel El-Arab (= Hauran, 1803 m) (Syria). They represented an important physical and ecological barrier between Mediterranean and xeric inland areas, which in turn consented the isolation and the development of endemic forms during glacial events.

Key to the species of the Genus *Prionosthenus*

1 Species of smaller size (Table 2). Body very much laterally compressed, fastigium much protruding, pronotum with prozona much higher than metazona and abdomen keel very raised (Figs 2, 6); aedeagus sclerites very stout and short (fig. 14)..... .....*P. galericulatus* (Stål, 1876) (CN Israel, N Jordan and SW Lebanon)

\- Species of larger size (Table 2). Body less laterally compressed, fastigium less protruding, pronotum with prozona just higher than metazona or regularly raised, abdomen keel less raised showing tergites with less pointed spines. 2

2 Pronotum regularly raised, males and females with prozona and metazona divided by an evident sulcus (Figs 1, 5). Aedeagus sclerites stout in lateral view and slender from back view (Figs 9, 13). .....*P. syriacus* (Brisout) (Mt. Hermon)

\- Pronotum much raised in males, less in females, where there is only an evident sulcus dividing prozona and metazona (Figs 3, 4, 7, 8). 3

3 Aedeagus sclerites slender in lateral view and bottle shaped from back view (Fig 15). *P. lebanicus* Dirsh (Lebanon) .....

\- Aedeagus sclerites with pointed apices (fig. 16).....*P. guleni* Karabag (S Turkey)

Table 2. Biometrics of *Prionosthenus* taxa here considered valid species. Sample size is reported in brackets (males/females); total length is measured from the head to the apex of hind femur.

Species	Total length		Pronotum length		Pronotum heigth		Hind femurus length		Hind femurs heigth	
	males	females	males	females	males	females	males	females	males	females
P. galericulatus (11/8)	23.1±1.2	37.0±1.5	5.1±0.5	9.3±0.6	6.6±0.2	11.7±0.7	10.3±0.6	15.0±0.9	3.0±0.1	4.2±0.3
P. syriacus (8/11)	25.1±1.1	43.7±3.2	5.8±0.4	12.0±0.5	7.0±0.4	13.3±0.7	12.3±0.5	18.5±1.1	4.0±0.3	5.8±0.5
P. lebanicus (10/25)	24.9±2.4	40.5±2.9	6.2±0.9	11.1±1.0	7.2±1.1	12.6±0.8	11.8±1.7	17.0±1.3	3.7±0.2	5.5±0.4
P. guleni (5/5)	29.5±0.4	45.0±3.6	6.5±0.3	10.2±0.8	7.7±0.2	12.3±0.6	13.4±0.8	18.8±1.7	4.2±0.2	5.4±0.3

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Hybridisation of *Glyptobothrus brunneus* and *Glyptobothrus bornhalmi* in northeastern Italy (Orthoptera Acridomorpha)

Abstract - In 1995 *Glyptobothrus bornhalmi* was found in the province of Trieste (region Friuli-Venezia Giulia, Italy). This is the first published record of this species in Italy. Bioacoustic and morphological studies show that *G. bornhalmi* hybridises with *G. brunneus* in this area. This is the first time hybridisation between these species has been made plausible. Near Trieste *G. bornhalmi* and *G. brunneus* are slightly different from the typical populations, respectively from Greece and western Europe. The males of Triestine *Glyptobothrus brunneus* have a larger number of stridulatory pegs and the males of Triestine *Glyptobothrus bornhalmi* produce shorter echemes.

Riassunto - *Ibridizzazione di* Glyptobothrus brunneus *e* Glyptobothrus bornhalmi *nell'Italia nord orientale (Orthoptera Acridomorpha).*
Nel 1995 *Glyptobothrus bornhalmi* è stato trovato per la prima volta in Italia, nella provincia di Trieste (regione Friuli-Venezia Giulia). Ricerche sulla bioacustica e morfologia mostrano che *G. bornhalmi* e *G. brunneus* si ibridano in questa zona. Tale fenomeno viene riportato per la prima volta per le due specie. Nell'area oggetto dello studio, nei dintorni di Trieste le due specie si distinguono dagli individui tipici. I maschi di *G. brunneus* hanno un numero di denti stridulatori piu basso ed i maschi di *G. bornhalmi* producono 'echemes' meno lunghi.

Key words: Orthoptera, bioacoustics, morphology, hybrid zone.

INTRODUCTION

The first author was able to study the Orthoptera fauna of the province of Trieste in 1995 and 1996. The main source of information was the Müller collection in the Museo Civico di Storia Naturale di Trieste, with many specimens from the 1920's and 1930's. Furthermore field studies were performed in 1995 and 1996. Some of the results are published in Kleukers et al. (1997: rediscovery of the Italian endemic bushcricket *Zeuneriana marmorata* (Fieber, 1853), Fontana & Kleukers (2000: first Italian records of *Stenobothrus stigmaticus* (Rambur, 1838) and *Pholidoptera dalmatica* (Krauss, 1899)) and Fontana & Kleukers, (2002: Orthoptera of coastal habitats in Italy). During the investigations a *Glyptobothrus* -species of the *biguttulus* group was found, which closely resembled *Glyptobothrus brunneus* (Thunberg, 1815), but had a completely different song. David Ragge kindly helped in identifying the song as that of *Glyptobothrus bornhalmi*. Later, unpublished earlier records of this species from 1991 from Opicina near Trieste by Sigfrid Ingrisch came to light. *Glyptobothrus bornhalmi* (Harz, 1971) (fig. 1) is reported here for the first time for Italia (see Failla et al., 1994), which shows that the species clearly occurs further northward than was known (Ragge et al., 1990). Further studies show evidence that *Glyptobothrus bornhalmi* hybridises with *G. brunneus* near Trieste.

Fig. 1. *Glyptobothrus bornhalmi*, male. Ucka (Croatia), 6-VIII-1996. Photo Roy Kleukers.

MATERIAL AND METHODS

In table 1 information on all analysed specimens is summarised. Singing males where tracked by their song, sometimes they were caught by sweep netting. They were collected, pinned and stored in the collection of the third author. Whenever possible the song of the males was recorded, either in the field or in the studio.

The stridulatory pegs of all collected males were counted.

The recordings were made using different recorders and microphones, at temperatures between 20 and 30°C. Analysis of the song by means of a computer has been confined to calling song only.

For comparison, several specimens of *Glyptobothrus bornhalmi* from Greece and *G. brunneus* from the Netherlands and Belgium have been included in our analyses.

SONG TERMINOLOGY

Calling song. The song produced by an isolated male.
Syllable. The sound produced by one up and downstroke of the hind femur.
Echeme. A first-order assemblage of syllables.

RESULTS

Already in the field, but more clearly after analysis, the songs of the recorded males from Trieste fell into three categories:

1. '*brunneus*', in which the song consists of a series of 4-10 short buzzing echemes, lasting 0,2-0,6s and repeated at intervals of about 1-3s. (fig. 2d). Typically an echeme consists of a fast repetition of short sounds. About each two sounds represent a syllable (Von Helversen & Von Helversen, 1994). Syllable repetition rate is about 50/s. The song of western European populations of *G. brunneus* is similar, but seems to consist of shorter echemes, lasting about 0,1-0,3s (fig. 2e).

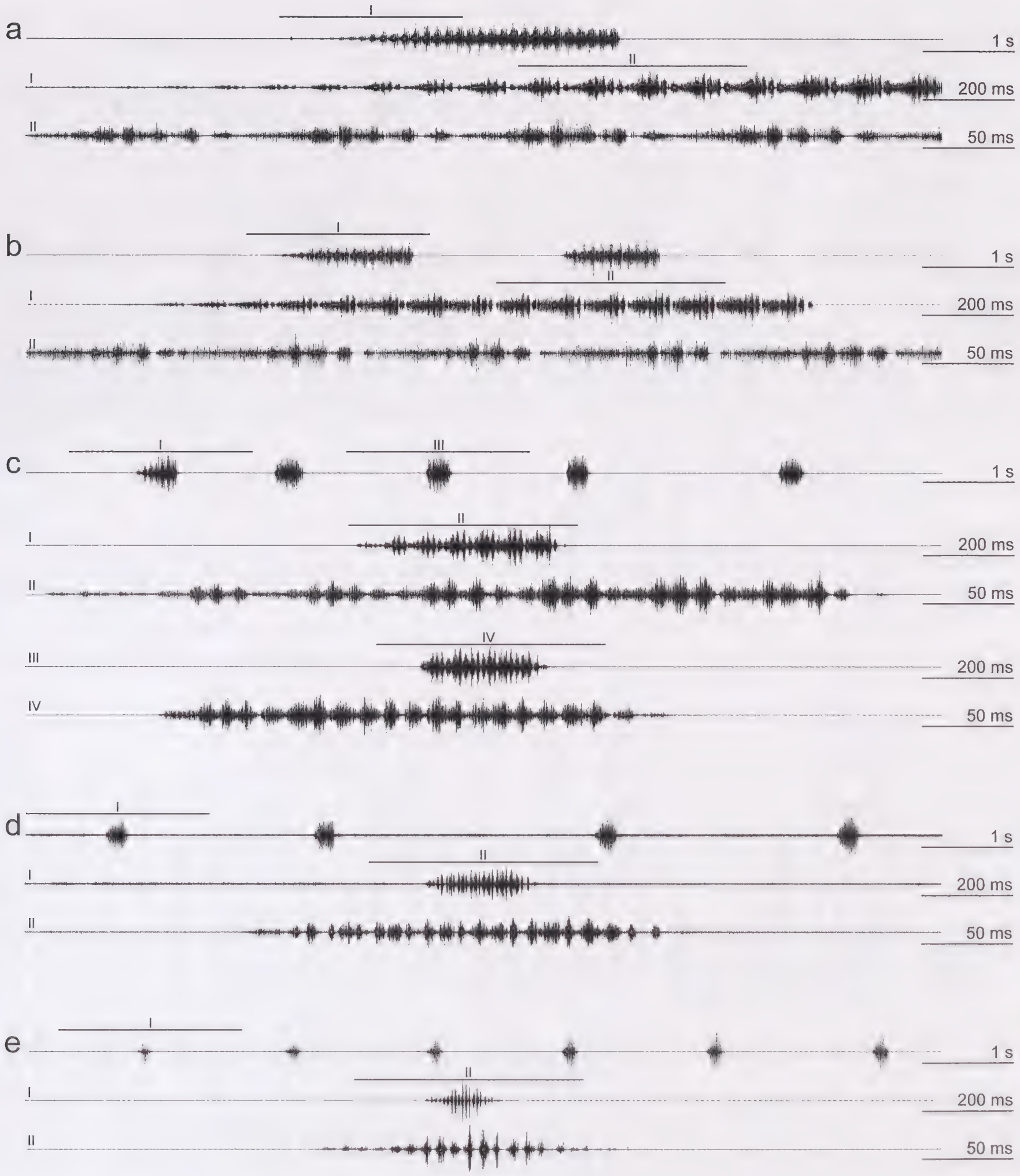

Fig. 2. Oscillograms (10s, 2s and 500ms) of the relevant categories.
a. *G. bornhalmi* - Greece; Mt Mainalon, Greece, Leg. F. Willemse, 20.VI.1986, recorded by F. Willemse in the field, 23 °C.
b. *G. bornhalmi* - Trieste; 1,2 km S Aquilina (FVG), Italy, Leg. R. Kleukers, 29.V.1995, recorded by B. Odé in the studio, 28 °C.
c. Intermediates - Trieste; Sistiana E (FVG), Italy, Leg. R. Kleukers, 16.VII.1995, recorded by R. Kleukers in the studio, 25-30 °C. Two details show the difference between the first and second echeme of the series.
d. *G. brunneus* - Trieste; San Giovanni al Timavo (FVG), Italy, Leg. R. Kleukers, 26.VII.1995, recorded by R. Kleukers in the field, 25-30 °C.
e. *G. brunneus* - Western Europe; Geuzenveld Amsterdam (NH), The Netherlands, Leg. B. Odé, 25.VII.1993, recorded by B. Odé in the studio, 28 °C.

Table 1. Details of collected and/or recorded male specimens of *Glyptobothrus bornhalmi, G. brunneus* and intermediates.

categorie	Day	Month	Year	Coordinates	Locality	Country	LEG	number of strid. pegs	longest echeme (ms)
bornhalmi Greece	01	08	1965		Ljuboten (Tetovo), Macedonia	Yugoslavia	Willemse F	135	
bornhalmi Greece	29	07	1971		Tymfristos Or., (Karpenision)	Greece	Willemse F	130	
bornhalmi Greece	05	08	1972		SW of Lamia, Iti Ori, near refuge above Ypati	Greece	Willemse F	149	
bornhalmi Greece	20	06	1986		Mt Mainalon	Greece	Willemse F	116	3600
bornhalmi Greece	14	06	1986		Mt Parnassos	Greece	Willemse F	136	3000
bornhalmi Greece	12	06	1986		Mt Olimbos	Greece	Willemse F	121	3860
bornhalmi Greece	09	08	1988		Mt Parnassos	Greece	Willemse F	132	2575
bornhalmi Greece	01	09	1989		Mt Olimbos, Stavros-Prioni	Greece	Willemse F	137	
bornhalmi Trieste	29	05	1995	UTM:VL069493	1,2 km S Aquilina	Italy	Kleukers R	145	1139
bornhalmi Trieste	18	06	1995	UTM:VL0360	M. Gurca, 2 km NW Opicina	Italy	Kleukers R	116	540
bornhalmi Trieste	15	06	1995	UTM:VL113522	Bagnoli sup.	Italy	Kleukers R	114	629
bornhalmi Trieste	15	06	1995	UTM:VL113522	Bagnoli sup.	Italy	Kleukers R	139	838
bornhalmi Trieste	27	06	1995	UTM:VL125547	1 km SE Basovizza	Italy	Kleukers R	123	1788
bornhalmi Trieste	02	07	1995	UTM:VL112523	M. S. Michèle, 100 N Bagnoli	Italy	Kleukers R	120	1206
bornhalmi Trieste	24	07	1995	UTM:VL116542	Foiba di Basovizza, 800 m S Basovizza	Italy	Kleukers R	117	662
bornhalmi Trieste	02	07	1995	UTM:VL112523	M. S. Michèle, 100 N Bagnoli	Italy	Kleukers R	109	
bornhalmi Trieste	19	07	1995	UTM:VL026503	S. Michèle, 200 m SW Muggia Vecchia	Italy	Kleukers R	104	1036
bornhalmi Trieste	19	07	1995	UTM:VL026503	S. Michèle, 200 m SW Muggia Vecchia	Italy	Kleukers R	110	823
bornhalmi Trieste	08	08	1995	UTM:UL979689	100 m S San Pelagio	Italy	Kleukers R	109	500
bornhalmi Trieste	06	08	1995	UTM:VL092549	500 m NE Longera	Italy	Kleukers R	124	800
bornhalmi Trieste	04	08	1995	UTM:VL075494	200 m E Noghera	Italy	Kleukers R		2432
bornhalmi Trieste	04	08	1995	UTM:VL075494	200 m E Noghera	Italy	Kleukers R	138	2432
bornhalmi Trieste	13	08	1995	UTM:VL079570	Monte Calvo	Italy	Kleukers R	135	1403
bornhalmi Trieste	25	08	1995	UTM:VL066645	500 m NE Rupingrande	Italy	Kleukers R	119	803
bornhalmi Trieste	03	08	1995	UTM:VL054608	Opicina NW	Italy	Kleukers R	85	741
brunneus Trieste	26	07	1995	UTM:UL905717	San Giovanni al Timavo (FVG)	Italy	Kleukers R		298
brunneus Trieste	26	07	1995	UTM:UL905717	San Giovanni al Timavo (FVG)	Italy	Kleukers R	111	246

brunneus	Trieste	26	07	1995	UTM:UL905717	San Giovanni al Timavo (FVG)	Italy	Kleukers R	357
brunneus	Trieste	04	08	1995	UTM:VL075494	200 m E Noghera (FVG)	Italy	Kleukers R 105	639
brunneus	Trieste	03	08	1995	UTM:VL054608	Opicina NW (FVG)	Italy	Kleukers R 93	322
brunneus	Trieste	08	08	1995	UTM:UL979689	100 m S San Pelagio (FVG)	Italy	Kleukers R 95	434
brunneus	Trieste	08	08	1995	UTM:UL979689	100 m S San Pelagio (FVG)	Italy	Kleukers R	432
brunneus	Trieste	13	08	1995	UTM:VL079570	Monte Calvo (FVG)	Italy	Kleukers R	202
brunneus	Trieste	26	09	1995	UTM:UL932695	beach Sistiana (FVG)	Italy	Kleukers R	617
brunneus	Trieste	26	09	1995	UTM:UL932695	beach Sistiana (FVG)	Italy	Kleukers R 101	676
intermediates	Trieste	16	07	1995	UTM:UL935700	Sistiana E (FVG)	Italy	Kleukers R	460
intermediates	Trieste	16	07	1995	UTM:UL935700	Sistiana E (FVG)	Italy	Kleukers R 132	317
intermediates	Trieste	01	08	1995	UTM:UL915728	100 m SW Medeazza (FVG)	Italy	Kleukers R 81	
intermediates	Trieste	25	08	1995	UTM:VL066645	500 m NE Rupingrande (FVG)	Italy	Kleukers R 100	863
intermediates	Trieste	29	08	1995	UTM:VL091594	1 km NE Trebiciano (FVG)	Italy	Kleukers R 115	518
intermediates	Trieste	09	10	1995	UTM:VL001688	Monte San Leonardo, 500 m N Samatorza (FVG)	Italy	Kleukers R	669
intermediates	Trieste	09	10	1995	UTM:VL001688	Monte San Leonardo, 500 m N Samatorza (FVG)	Italy	Kleukers R 110	
brunneus	W-Europe					Stikke Trui (GL)	The Netherlands	Reemer M 66	
brunneus	W-Europe	03	07	1993	AC:1858 4276	Nijmegen, tuin Boksdoornstraat (GL)	The Netherlands	Kleukers R 59	
brunneus	W-Europe	27	08	1997	AC:189 423	spoorlijn Heumensoord (GL)	The Netherlands	Kleukers R 67	
brunneus	W-Europe	28	09	1997	AC:184 463	Gerritsfles, heide (GL)	The Netherlands	Kleukers R & Krekels R 50	
brunneus	W-Europe	13	07	2001	AC:199 318	spoorwegemplacement Spekholzerheide (LI)	The Netherlands	Reemer M 73	
brunneus	W-Europe	25	07	1993		Geuzenveld Amsterdam (NH)	The Netherlands	Odé B	228
brunneus	W-Europe	21	06	1993		Franse Kampheide, Bussum (NH)	The Netherlands	Odé B	178
brunneus	W-Europe	13	07	2001		Ste. Barbe, Mortehan (Lux)	Belgium	Odé B	158

2. '*bornhalmi*', in which the song consists of a short series of 1-6 echemes, lasting 0,4-2,5s and repeated at intervals of 1-4s (fig. 2b). Echemes gradually increase in loudness and show a clear syllabic structure, the syllables repeated at the rate of about 10/s. This song is very much related to the song of typical *G. bornhalmi*. However, in the typical *G. bornhalmi* from Greece the song tends to consist of only 1-3 echemes, lasting about 1,5-4s (Ragge et al., 1990; Ingrisch & Pavicevic, 1985) (fig. 2a).
3. 'intermediates', in which the song is more or less intermediate between the above categories. The calling song consists of a series of echemes with a syllabic structure that can resemble both *G. brunneus* and *G. bornhalmi*. In several cases the first echeme of a series resembles a short echeme of *G. bornhalmi*, whereas the following echemes strongly resemble those of *G. brunneus* (fig. 2c). It should be stressed that especially in the intermediates the song is extremely variable. Figure 2c only shows one example of an intermediate song.

In figure 3 the mean length of the echemes of the song for the different categories is shown. It is clear that males of the *bornhalmi* category from Trieste have a shorter song than typical *G. bornhalmi* from Greece.

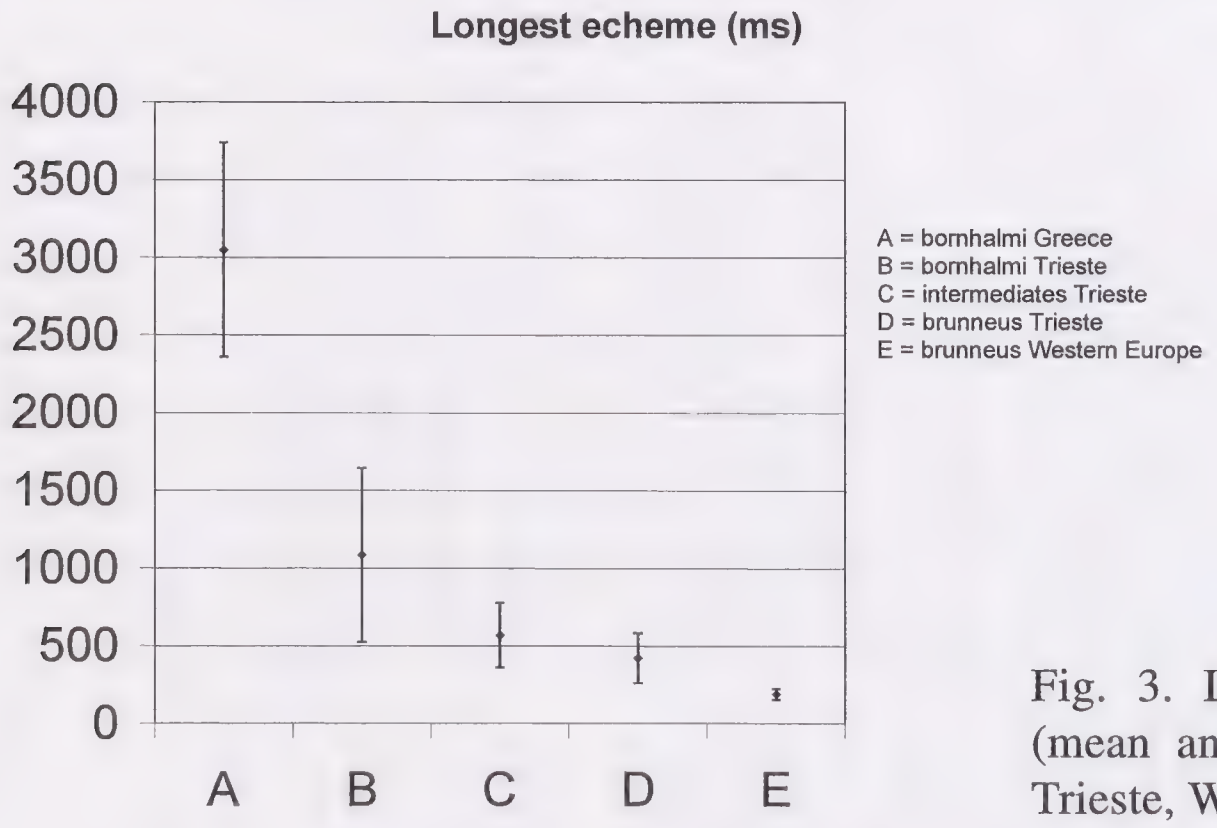

Fig. 3. Length of the longest echeme (mean and sd) of recorded males from Trieste, Western Europe and Greece.

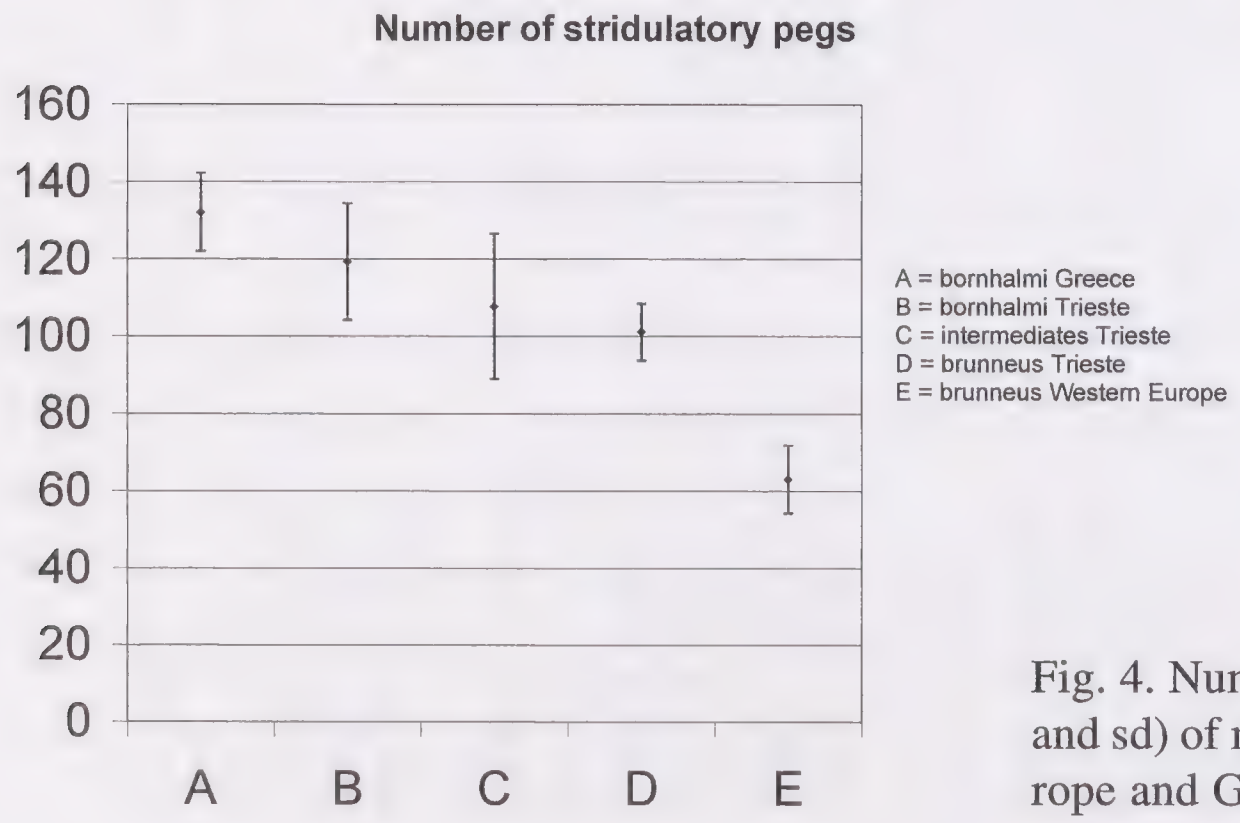

Fig. 4. Number of stridulatory pegs (mean and sd) of males from Trieste, Western Europe and Greece.

In figure 4 the mean number of stridulatory pegs of the different categories are shown, together with data of typical populations of the Netherlands (*G. brunneus*) and the Balkan (*G. bornhalmi*). Males of the *brunneus* category have a significantly larger number of pegs than typical *G. brunneus*. The number of pegs of the males of the *bornhalmi* category falls within the range of typical *G. bornhalmi*. The males that were classified as intermediates by their song also have an intermediate number of pegs.

There seems to be a strong correlation between the echeme length and the number of stridulatory pegs (fig. 5).

The taxa show a remarkable difference in phenology. Males of the *bornhalmi* category were found from May until August and those of the *brunneus* category from July to September. Intermediates were found from July up until October.

In figure 6 the distribution of the different categories over the province of Trieste is shown. Specimens from the *bornhalmi* category are found predominantly in the southern part of the province, whereas the *brunneus* category mostly is found in the north. Only one specimen was found near Noghera in the south. In four localities the two taxa were found on exactly the same site. The intermediates were found in five localities in the north-eastern part of the province, on one occasion together with a specimen of the *bornhalmi* category.

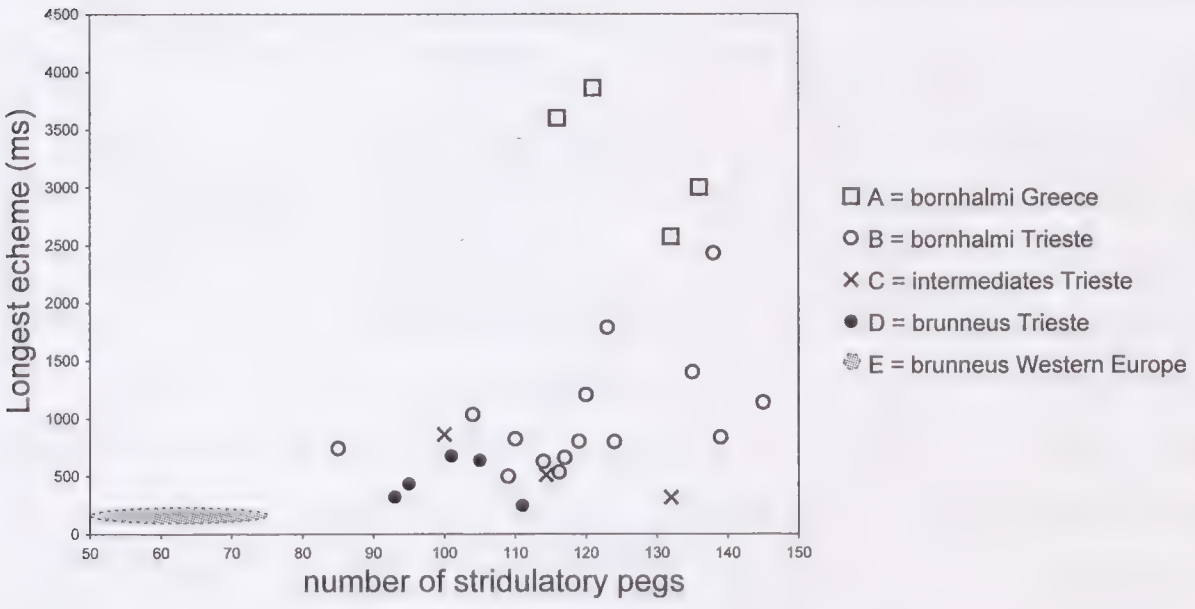
Longest echeme (ms)
number of stridulatory pegs
A = bornhalmi Greece
B = bornhalmi Trieste
C = intermediates Trieste
D = brunneus Trieste
E = brunneus Western Europe

Fig. 5. Number of stridulatory pegs versus the length of the longest echeme. As we do not have combined data of number of stridulatory pegs and echeme length in western European *G. brunneus*, we indicated the range of both variables from this region.

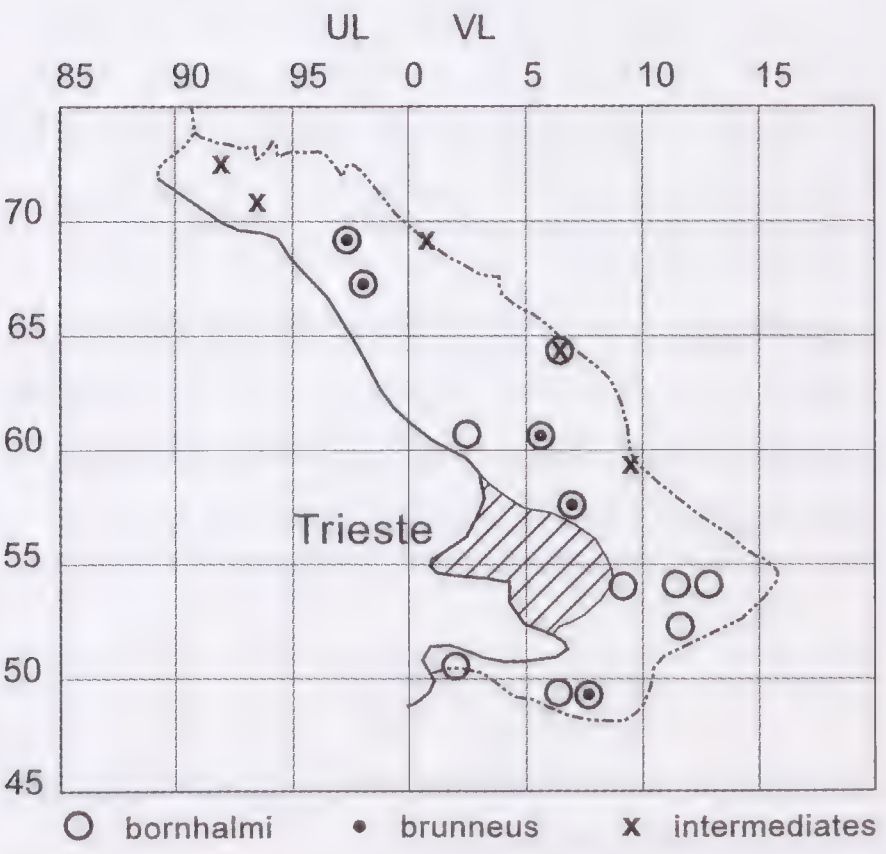

Fig. 6. Distribution of the categories in the province of Trieste. Circles: *bornhalmi*, dots: *brunneus*, crosses: intermediates.

Although we have relatively few complete data the specimens from Trieste clearly form a bridge between typical *brunneus* in Western Europe and *bornhalmi* in the Balkan.

DISCUSSION

Although the males of both the *brunneus* and the *bornhalmi* category of the Trieste area slightly differ from typical specimens, we can confidently arrange them under the respective species. The overall similarity of both taxa is clear and indicates a very close relationship. The occurrence of intermediate specimens and the geographical distribution of the three categories support the view that both taxa hybridise within the studied area.

Hybridisation is well known in the Gomphocerinae. An extensively studied case is that between *C. p. parallelus* and *C. p. erythropus* in the Pyrenees (e.g. Butlin et al., 1992).

Hybridisation in the *Glyptobothrus biguttulus* group also is well documented. Perdeck (1957) showed that crossbreeding between *Glyptobothrus brunneus*, *G. biguttulus* and *G. mollis* can be induced without problems in the lab, yielding fertile intermediate offspring. Von Helversen and Von Helversen (1975) discussed the bioacoustics of laboratory-reared hybrids between *G. mollis* and *G. biguttulus*. Ragge (1984) shows a hybrid population of *G. mollis* and *biguttulus* in the French Alpes-Maritimes. In the Peloponnese (Greece) hybridisation in the *Glyptobothrus biguttulus* group seems to be common (Willemse, in prep.). Our data also indicate hybridisation under natural conditions between *Glyptobothrus brunneus* and *G. bornhalmi* in north-east Italy.

Until now the number of stridulatory pegs has been considered an important character for separating *G. brunneus* and *G. bornhalmi* (< 100 versus 105-153) (Fontana et al., 2002). The results from this study clearly show that at least for the Italian territory this character is unreliable, as there is a substantial overlap (fig. 4).

As the specimens of the *bornhalmi* category in the area of Trieste - at least in part - seem to be the product of hybridisation and differ clearly from typical *bornhalmi* from Greece, one could ask if *Glyptobothrus bornhalmi* can really be called part of the Italian fauna. Although the administrational borders are not relevant for the understanding of distribution patterns, they are used in national or regional checklists, biodiversity counts etc. In our view *Glyptobothrus bornhalmi* should be considered a species of the Italian fauna, as the population near Trieste clearly cannot be regarded as purely consisting of *Glyptobothrus brunneus*. *Glyptobothrus bornhalmi* at least has a substantial influence in the gene pool.

It would be very interesting to investigate the borders of this 'hybrid zone' in northern Italy and ex-Yugoslavia. Does it extend all along the zone of contact in the Balkan and if so, at which distance occur typical *brunneus* and *bornhalmi*? It will be a challenge to document this new interesting example of hybridisation within the Gomphocerinae.

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The Orthopteroid insects of the Abruzzo, Lazio and Molise National Park and surrounding localities (Central Apennine, S Italy)

(Blattaria, Mantodea, Orthoptera, Phasmatodea, Dermaptera)

Abstract - The Abruzzo, Lazio and Molise National Park (PNALM), established as a private institution in 1922 and recognised by a State law in 1923, is the oldest Italian Protected Area and extends over 50,000 hectares on Abruzzo, Latium and Molise regions. The territory is mountainous, main peaks being Mt Greco (2,285 m), Mt Petroso (2,249 m), Mt Marsicano (2,245 m) and Mt La Meta (2,242 m). During the glacial ages, glaciers covered much of this area and the flora and fauna remained isolated, differentiating from other Italian areas. Consequently, many Apennine species are endemic to a single mountain. Another interesting aspect of the Central Apennine is the presence of xerothermic areas on high altitude, where xerophilous species live not far from orophilous ones. This aspect makes the fauna and flora of Central Apennine very rich and peculiar. In the past, the PNALM has been studied by several orthopterologists (Capra, Baccetti and La Greca). Recently new field researches have been carried out by Centro Studi Ecologici Appenninici of the PNALM, in co-operation with the Dipartimento di Agronomia Ambientale e Produzioni Vegetali (Entomologia) of the University of Padua, Italy and the Dipartimento di Biologia Animale e dell'Uomo, University of Rome "La Sapienza", Italy. On the basis of the available literature and of new field data, it has been possible to update a checklist. The number of taxa till now recorded for the PNALM and contiguous localities is 84: 5 Blattaria, 1 Mantodea, 68 Orthoptera, 2 Phasmatodea and 8 Dermaptera. The most interesting taxa are *Capraiellus tamaninii*, *Ectobius caprai* (Blattodea), *Barbitistes yersini*, *Tettigonia cantans*, *Decticus aprutianus*, *Bicolorana bicolor bicolor*, *Saga pedo*, *Ephippiger cavannai*, *Ephippiger ruffoi*, *Italopodisma acuminata acuminata*, *I. a. marsicana*, *I. trapezoidalis trapezoidalis*, *I. t. aprutiana*, *Aeropus sibiricus sibiricus*, *Chorthippus bruttius*, *Italohippus monticola* (Orthoptera), *Bacillus rossius rossius*, *Clonopsis gallica* (Phasmatodea), *Pseudochelidura orsinii*, *Forficula silana* (Dermaptera). For each taxon the list of known localities and ecological and biogeographical remarks concerning the investigated area are presented. The synonymy of *Forficula abrutiana* Borelli, 1916 with *F. auricularia* Linnaeus 1758 is confirmed. In addition, in the discussion of the distribution of *Forficula pubescens* Serville, 1839, the absence of *Forficula lesnei* Finot, 1887 from Sardinia, where has been recently recorded, is also discussed.

Riassunto - *Gli Insetti Ortotteroidei del Parco Nazionale d'Abruzzo, Lazio e Molise e località limitrofe (Appennino centrale, sud Italia) (Blattaria, Mantodea, Orthoptera, Phasmatodea, Dermaptera).*

Il Parco Nazionale d'Abruzzo, Lazio e Molise (PNALM), istituito come ente privato nel 1922 e riconosciuto da una legge statale nel 1923, è la più antica Area Protetta italiana e si estende su 50.000 ettari sulle regioni Abruzzo, Lazio e Molise. Il territorio è montagnoso, i rilievi principali sono il Monte Greco (2.285 m), Monte Petroso (2.249 m), Monte Marsicano (2.245 m) e Monte La Meta (2.242 m). Durante le ere glaciali, i ghiacciai coprirono gran parte di quest'area, quindi la flora e la fauna rimasero isolate, differenziandosi dalle altre zone italiane. Di conseguenza molte specie Appennine sono endemiche di una sola montagna. Un altro aspetto interessante dell'Appennino Centrale è la presenza di aree xerotermiche a quote elevate, dove specie xerofile vivono non lontano da altre orofile. Questo aspetto rende la flora e la fauna dell'Appennino Centrale molto ricca e peculiare. In passato, il PNALM è stato studiato da molti

ortotterologi (Capra, Baccetti e La Greca). Recentemente nuove ricerche di campo sono state eseguite dal Centro Studi Ecologici Appenninici del Parco Nazionale d'Abruzzo Lazio e Molise in collaborazione col Dipartimento di Agronomia Ambientale e Produzioni Vegetali (Entomologia) dell'Università di Padova e il Dipartimento di Biologia Animale e dell'Uomo, Univ. di Roma "La Sapienza". Sulla base della letteratura disponibile e di nuovi dati di campo, è stato possibile aggiornare una checklist. Il numero di taxa finora rinvenuti nel parco e nelle zone contugue è 84: 5 Blattaria, 1 Mantodea, 68 Orthoptera, 2 Phasmatodea e 8 Dermaptera. Le specie più interessanti sono *Capraiellus tamaninii*, *Ectobius caprai* (Blattodea), *Barbitistes yersini*, *Tettigonia cantans*, *Decticus aprutianus*, *Bicolorana bicolor bicolor*, *Saga pedo*, *Ephippiger cavannai*, *Ephippiger ruffoi*, *Italopodisma acuminata acuminata*, *I. a. marsicana*, *I. trapezoidalis trapezoidalis*, *I. t. aprutiana*, *Aeropus sibiricus sibiricus*, *Chorthippus bruttius*, *Italohippus monticola* (Orthoptera), *Bacillus rossius rossius*, *Clonopsis gallica* (Phasmatodea), *Pseudochelidura orsinii*, *Forficula silana* (Dermaptera). Per ogni taxon viene fornito l'elenco delle località finora note e alcune osservazioni ecologiche e biogeografiche relative all'area del Parco. Viene inoltre definitivamente confermata la sinonimia di *Forficula abrutiana* Borelli, 1916 con *F. auricularia* Linnaeus 1758. In aggiunta, trattando la distribuzione di *Forficula pubescens* Serville, 1839 viene discussa l'assenza di *Forficula lesnei* Finot, 1887 dalla Sardegna, per cui è stata recentemente segnalata.

Key words: Orthopteroidea, faunistic, protected area, endemic taxa, Italy.

INTRODUCTION

In the past, orthopterofauna of the Abruzzo, Lazio and Molise National Park (PNAML) has been studied by several entomologists (E. Giglio-Tos, F. Capra, A. Borelli, M. La Greca, A. Galvagni, R. Ebner, B. Baccetti, A. Vigna Taglianti and G. Osella). Though some of them published data on the Park within works not specifically concerning this area, all the information on Orthopteroid insects of the PNALM are scattered in many papers, difficult to consult. Only Marcello La Greca, in collaboration with A. Messina, published a paper putting together the results obtained during years of field researches (La Greca & Messina, 1982); most of the specimens concerned are preserved in the La Greca Collection (Museo Civico di Storia Naturale of Milan), one of the largest collections of Orthopteroidea of Abruzzo, Lazio and Molise National Park.

Recently new field researches have been carried out by the Servizio Scientifico (previously Centro Studi Ecologici Appenninici) of the PNALM in co-operation with the Dipartimento di Agronomia Ambientale e Produzioni Vegetali (Entomologia) of the University of Padua, Italy and the Dipartimento di Biologia Animale e dell'Uomo, University "La Sapienza" of Rome, Italy. On the basis of the available literature and of new field data, it has been possible to update the previously available checklist (Fontana et al., 2001). Presently, the number of species recorded for the PNALM and surrounding localities is 84, namely 5 Blattaria, 1 Mantodea, 68 Orthoptera, 2 Phasmatodea and 8 Dermaptera. We report here this list, following nomenclature and systematic adopted by Failla et al. (1994); family taxonomy of Orthoptera follows Fontana et al. (2002).

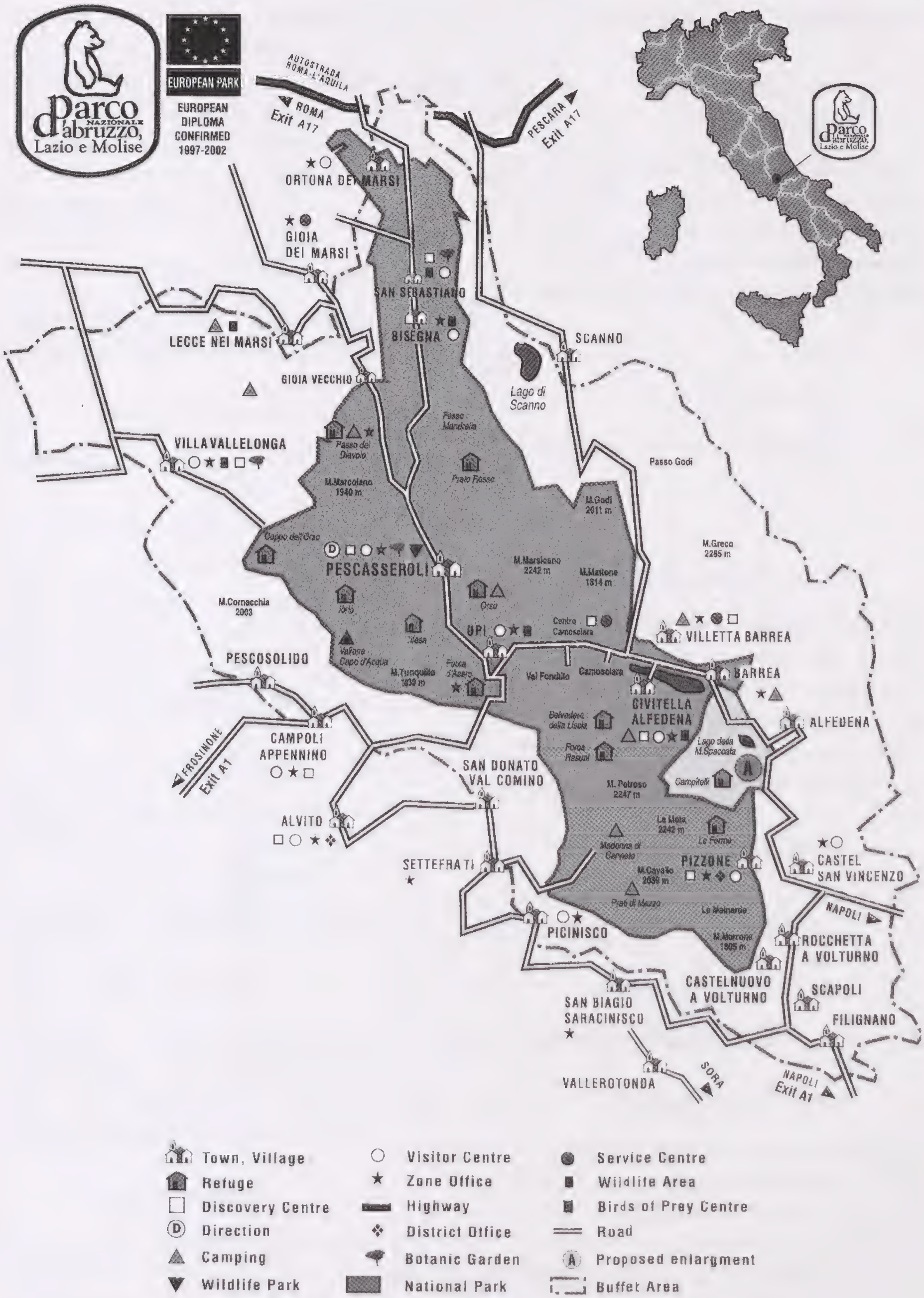

Fig. 1. PNALM general map (from the courtesy of Ente Autonomo Parco Nazionale d'Abruzzo, Lazio e Molise).

PRELIMINARY CHECKLIST FOR PNALM AND SURROUNDING LOCALITIES

BLATTARIA

Fam. Blattidae

Capraiellus tamaninii Galvagni, 1972
Ectobius caprai Galvagni, 1971
Ectobius montanus (A. Costa, 1866)
Ectobius sylvestris (Poda, 1761)
Phyllodromica marginata (Schreber, 1781)

MANTODEA

Fam. Mantidae

Mantis religiosa religiosa Linnaeus, 1758

ORTHOPTERA

Fam. Phaneropteridae

Tylopsis liliifolia (Fabricius, 1793)
Barbitistes alpinus Fruhstorfer, 1921
Barbitistes yersini Brunner, 1878
Leptophyes laticauda (Frivaldsky, 1867)
Leptophyes punctatissima (Bosc, 1792)
Poecilimon superbus (Fischer, 1854)

Fam. Meconematidae

Meconema meridionale A. Costa, 1860
Meconema thalassinum (De Geer, 1773)

Fam. Conocephalidae

Xiphidion discolor discolor (Thunberg, 1815)

Fam. Tettigoniidae

Tettigonia cantans (Fuessly, 1775)
Tettigonia viridissima Linnaeus, 1758
Decticus albifrons (Fabricius, 1775)
Decticus aprutianus Capra, 1936
Decticus verrucivorus verrucivorus Linnaeus, 1758
Platycleis grisea grisea (Fabricius, 1781)
Tessellana tessellata tessellata (Charpentier, 1825)
Bicolorana bicolor bicolor (Philippi, 1830)

Sepiana sepium (Yersin, 1854)
Pholidoptera fallax (Fischer, 1854)
Pholidoptera griseoaptera (De Geer, 1775)
Eupholidoptera chabrieri chabrieri (Charpentier, 1825)
Yersinella raymondi (Yersin, 1860)
Rhacocleis germanica (Herrich-Schaeffer, 1840)
Saga pedo (Pallas, 1771)

Fam. Bradyporidae

Ephippiger cavannai (Targioni Tozzetti, 1881)
Ephippiger ruffoi Galvagni, 1955

Fam. Rhaphidophoridae

Dolichopoda geniculata (A. Costa, 1860)

Fam. Gryllidae

Gryllus campestris Linnaeus, 1758
Gryllus bimaculatus De Geer, 1773
Eumodicogryllus burdigalensis burdigalensis (Latreille, 1804)
Pteronemobius concolor (Walker, 1871)
Oecanthus pellucens pellucens (Scopoli, 1763)

Fam. Mogoplistidae

Mogoplistes brunneus Serville, 1839

Fam. Gryllotalpidae

Gryllotalpa gryllotalpa (Linnaeus, 1758)

Fam. Tetrigidae

Paratettix meridionalis (Rambur, 1838)
Uvarovitettix depressus (Brisout, 1848)
Tetrix bipunctata kraussi (Saulcy, 1888)
Tetrix subulata (Linnaeus, 1758)

Fam. Acrididae

Italopodisma acuminata acuminata (La Greca, 1969)
Italopodisma acuminata marsicana (La Greca, 1969)
Italopodisma fiscellana (La Greca, 1954)
Italopodisma trapezoidalis aprutiana (La Greca, 1969)
Italopodisma trapezoidalis trapezoidalis (La Greca, 1969)

Pezotettix giornai (Rossi, 1794)
Calliptamus italicus italicus (Linnaeus, 1758)
Calliptamus siciliae Ramme, 1927
Locusta migratoria cinerascens Fabricius, 1781
Oedipoda caerulescens caerulescens (Linnaeus, 1758)
Oedipoda germanica (Latreille, 1804)
Aiolopus strepens strepens (Latreille, 1804)
Omocestus rufipes (Zetterstedt, 1821)
Dirshius haemorrhoidalis haemorrhoidalis (Charpentier, 1825)
Dirshius petraeus (Brisout, 1855)
Stenobothrus apenninus Ebner, 1915
Stenobothrus lineatus lineatus (Panzer, 1796)
Stenobothrus nigromaculatus nigromaculatus (Herrich-Schaeffer, 1840)
Aeropus sibiricus sibiricus (Linnaeus, 1758)
Gomphocerus rufus (Linnaeus, 1758)
Myrmeleotettix maculatus maculatus (Thunberg, 1815)
Stauroderus scalaris scalaris (Fischer Waldheim, 1846)
Chorthippus bruttius Fontana & La Greca, 1999
Chorthippus dorsatus dorsatus (Zetterstedt, 1821)
Chorthippus parallelus parallelus (Zetterstedt, 1821)
Italohippus monticola Ebner, 1915
Glyptobothrus brunneus brunneus (Thunberg, 1815)
Glyptobothrus rubratibialis Schmidt, 1978
Glyptobothrus vagans vagans (Eversmann, 1848)
Euchorthippus declivus (Brisout, 1848)

PHASMATODEA

Fam. Bacillidae

Bacillus rossius rossius (Rossi, 1788)
Clonopsis gallica (Charpentier, 1825)

DERMAPTERA

Fam. Labiidae

Labia minor (Linnaeus, 1758)

Fam. Forficulidae

Pseudochelidura orsinii (Gené, 1833)
Apterygida albipennis (Megerle in Charpentier, 1825)
Forficula auricularia Linnaeus, 1758
Forficula decipiens Gené, 1832

Forficula obtusangula Krauss, 1904
Forficula pubescens Gené, 1832
Forficula silana Costa, 1881

DISCUSSION ON THE SPECIES

For each taxon the available data are listed in a table reporting the following information:
FIRST COLUMN: Locality recorded in the specimens collected or drawn from literature (localities are listed in alphabetic order).
SECOND COLUMN: altitude in meters (if available).
THIRD COLUMN: region.
FOURTH COLUMN: province.
FIFTH COLUMN: data origin (collection, literature, etc.) abbreviated as below:

COLLECTION:
BO = Bartolomeo Giuseppe Osella (L'Aquila);
IEB = Istituto di Entomologia dell'Università di Bologna (coll. Menozzi);
LG = M. La Greca (Museo civico di Storia Naturale, Milan);
MZUF = Museo zoologico "La Specola" dell'Università, Florence;
MVE = Museo civico di Storia naturale, Venice;
MVR = Museo civico di Storia naturale, Verona;
MZUR = Museo di Zoologia dell'Università di Roma "La Sapienza;
PF = P. Fontana (Isola Vicentina);
PNA = Centro Studi Appenninici of Abruzzo, Lazio and Molise National Park (Pescasseroli);
PT = P. Tollis (Alfedena);
VT = A. Vigna Taglianti (Rome).

LITERATURE:
Bacc58 = Baccetti, 1958;
Bacc59b = Baccetti, 1959b;
Bacc63 = Baccetti, 1963;
Bacc91 = Baccetti, 1991;
BaCa59 = Baccetti & Capra, 1959;
BaCa69 = Baccetti & Capra,1969;
Bor16 = Borelli, 1916;
Capr36 = Capra, 1936;
Ebn15 = Ebner, 1915;
Galv68 = Galvagni, 1968;
Galv71 = Galvagni, 1971;
Galv73 = Galvagni, 1973;
Gtos15 = Giglio Tos, 1915;
LaGr69 = La Greca, 1969;
LaGrMe82 = La Greca & Messina, 1982;
LaGrAl97 = La Greca et al., 1997;
LaOs94 = Laurenzi & Osella, 1994;
Macc33 = Maccagno, 1933;
Mas99 = Massa, 1999
Stei79 = Steinmann, 1979;
VTA99 = Vigna Taglianti, 1999;
VTAip = Vigna Taglianti, in press.

Data with generic locality "Abruzzo National Park", like those recorded by Grandi (1958) are listed only when they are the only available ones.

For each species general distribution and ecological, biogeographical and, in some cases, taxonomical remarks are presented. General distribution, if not differently stated, has been drawn from Fontana et al. (2002).

Ord. BLATTARIA

Fam. Blattidae

Capraiellus tamaninii Galvagni, 1972

AVAILABLE DATA				
Piane d'Avegno, Roccaraso	1550	Abr	AQ	PF
Scanno, Frattura, M. Genzana	1400	Abr	AQ	PF

GENERAL DISTRIBUTION. Italian Peninsula, Sicily and Balkanic peninsula to the Peloponnesos.

ECOLOGY AND REMARKS. Lives on trees and bushes from the submontane to the montane level (Fontana et al., 2002).

Ectobius caprai Galvagni, 1971

AVAILABLE DATA				
Piane d'Avegno, Roccaraso	1550	Abr	AQ	PF

GENERAL DISTRIBUTION. Apennine endemic species, present in central and S Italy.

ECOLOGY AND REMARKS. Alpine to sub-alpine species (rarely montane), it lives on dense and high grasses of pastures.

Ectobius montanus (A. Costa, 1866)

AVAILABLE DATA				
Forca d'Acero	1500	Abr	AQ	PF
M. Greco, Toppe del Tesoro	2100	Abr	AQ	PF
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Passo di Godi, Fonte Pantano		Abr	AQ	PF
Piane d'Avegno, Roccaraso	1550	Abr	AQ	PF
Scanno, Frattura, M. Ganzana	1400	Abr	AQ	PF
Val di Corte	1400	Abr		PF

GENERAL DISTRIBUTION. Apennine endemic species, distributed from Emilia Romagna region to Southern Italy.

ECOLOGY AND REMARKS. Montane to alpine species, it lives on grasses in alpine pastures or in the underwood. (Andreetti & Osella, 2001)

Ectobius sylvestris (Poda, 1761)

AVAILABLE DATA				
Le Forme	1500	Mol	IS	PF

GENERAL DISTRIBUTION. Widespread in Europe, from Scandinavia to S Italy (Calabria region) and Balkanic peninsula.

ECOLOGY AND REMARKS. Montane species, very common in Alpine beech woods; in Apennines it is scattered and present only in fresh and montane woods.

Phyllodromica marginata (Schreber, 1781)

AVAILABLE DATA				
Lago di Castel San Vincenzo	700	Mol	IS	PF

GENERAL DISTRIBUTION. Eastern European species, distributed from S Russia to Italy, where it is common in the Central and Southern peninsula and in Sardinia and Sicily islands.

ECOLOGY AND REMARKS. Termophilous species, it lives in dry underwoods or meadows often with large populations.

Ord. MANTODEA

Fam. Mantidae

Mantis religiosa religiosa Linnaeus, 1758

AVAILABLE DATA				
Lago di Castel San Vincenzo	700	Mol	IS	PF
Villetta Barrea	990	Abr	AQ	PF

GENERAL DISTRIBUTION. Widely distributed in S Europe, N and Central Africa and Middle Asia.

ECOLOGY AND REMARKS. It is the only mantid species up till now found in the PNALM, where it lives in warm and sunny habitats.

Ord. ORTHOPTERA

Fam. Phaneropteridae

Tylopsis liliifolia (Fabricius, 1793)

AVAILABLE DATA				
Gioia Vecchio	1250	Abr	AQ	LG
Colle della Croce, Barrea	1150	Abr	AQ	PF
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago di Barrea Nord	971	Abr	AQ	PF
Lago Montagna Spaccata	1050	Abr	AQ	PT

GENERAL DISTRIBUTION. Widespread from S Europe and N Africa to S Russia. In Italy is present along all the peninsula, in Sardinia and Sicily islands.

ECOLOGY AND REMARKS. Xerotermophilous species living in grasslands, not on bushes or trees (Fontana et al., 2002).

Barbitistes alpinus Fruhstorfer, 1921

AVAILABLE DATA				
Pescasseroli	1400	Abr	AQ	LG
Sorgenti del Fondillo	1400	Abr	AQ	LG; LaGrMe82

GENERAL DISTRIBUTION. *Barbitistes alpinus* is present in the Alps and in particular in S-Eern France, in S Switzerland and in Italy, from the Alps to Central Apennine.

ECOLOGY AND REMARKS. Montane species living on trees, bushes and herbs (Fontana et al., 2002). Fontana & Buzzetti (this volume) consider *Barbitistes obtusus alpinus* Fruhstorfer, 1921 as valid species and refer to it all the alpine and apennine populations previously assigned to *B. obtusus;* they also state to use the name *Barbitistes obtusus* only for the male from Sardinia described by Targioni Tozzetti (1881).

Barbitistes yersini Brunner, 1878

AVAILABLE DATA				
Pescasseroli, Mandrella, sentiaro Z1	1300	Abr	AQ	PF
Pettorano sul Gizio	900	Abr	AQ	PF
Sperone (uninhabited village)	1221	Abr	AQ	PF

GENERAL DISTRIBUTION. Transadriatic species, widely distributed along the Balkanic peninsula from the Carso Triestino (Italy) to Corfù island, and recently recorded for several localites in Central-Sern Italy (La Greca et al., 1997).

ECOLOGY AND REMARKS. Termophilous species, present early in the season (May-July) and living on bushes or small trees. It is common on *Spartium junceum*, *Pistacia lentiscus*, *Fraxinus* sp., and also on *Ostrya carpinifolia*; in the PNALM it has been found also in a beech wood.

Leptophyes laticauda (Frivaldsky, 1867)

AVAILABLE DATA				
Pettorano sul Gizio	900	Abr	AQ	PF
Val Fondillo	1300	Abr	AQ	PF
Villetta Barrea	990	Abr	AQ	PF, PT

GENERAL DISTRIBUTION. Central Europe, from France to Romania; in Italy distributed from the N to Abruzzo region (Fontana et al., 2002).

ECOLOGY AND REMARKS. Mesophilus to mesohygrophilous submontane species, living

on bushes or small trees. In the PNALM it has been found on small trees of *Salix* sp., in wet habitats (Val Fondillo, Villetta Barrea) and on *Ostrya carpinifolia*, in a mesophilous habitat of the loc. of Pettorano sul Gizio, together with *Barbitistes yersini*.

Leptophyes punctatissima (Bosc, 1792)

AVAILABLE DATA				
Lago Montagna Spaccata	1050	Abr	AQ	PT

GENERAL DISTRIBUTION. W, Central and S Europe; in Italy it is common in western Alps, while it seems scattered along Italian Peninsula, Sardinia and Sicily.

ECOLOGY AND REMARKS. Mesophilous species living on trees or bushes or even on *Rubus* sp. or tall herbs. It lives on ecotones, sometimes in bushed meadows or clearings.

Poecilimon superbus (Fischer, 1854)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF
Forca d' Acero	1500	Abr	AQ	PF
La Meta		Abr	AQ	LaOs94, LaGrMe82
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago Montagna Spaccata	1050	Abr	AQ	PT
Lago Vivo	1600	Abr	AQ	LG; LaGrMe82
Le Forme	1441	Mol	IS	PF
M. Pietroso		Abr	AQ	LaGrMe82
Madonna di Tronchillo	1550	Abr	AQ	LG; LaGrMe82
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Pietroso	1750	Abr	AQ	LG
Passo dell'Orso	1650	Abr	AQ	LG; LaGrMe82
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1000	Abr	AQ	LG, LaOs94
Rif. Pesco Iorio	1850	Abr	AQ	PF
Rocca di Cambio		Abr	AQ	LaGrMe82
Scanno	1900	Abr	AQ	LG
Serra di Rocca Chiarano	1700	Abr	AQ	LG, LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LG, LaGrMe82
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Lunga	1900	Abr	AQ	LG, LaGrMe82
Valle Profluo	1100	Abr	AQ	LG, LaGrMe82
Valle Resione	1400	Abr	AQ	LG, LaGrMe82
Villetta Barrea		Abr	AQ	Gtos15; LaOs94

GENERAL DISTRIBUTION. Italian endemic species, present from Liguria region to Aspromonte Mts (Calabria region), more common along tyrrhenian coast.

ECOLOGY AND REMARKS. *P. superbus* lives from the sea level (Maratea, Basilicata region, P.F.) up to the subalpine or even alpine pastures in Sern Apennine. Low altitude pupulations are composed by big individuals with relatively longer legs. In the PNALM as well as in the La Laga Mts (Andreetti & Osella, 2001) it is the commonest Ensifera species. It lives in ecotone habitats, in bushed meadows or in pastures, where it is concentrated on tall grasses. Heller (1984 and 1988), on the basis of its bioacoustics, considers *P. superbus* as a subspecies of *P. jonicus* (Fieber, 1853). Only molecular analysis will provide a definitive answer to this interpretation.

Fam. Meconematidae

Meconema meridionale A. Costa, 1860

AVAILABLE DATA				
Lago di Castel San Vincenzo	700	Mol	IS	PF
Villetta Barrea, Centro Internaz.	990	Abr	AQ	PF

GENERAL DISTRIBUTION. European species distributed from Central Europe to Sicily.

ECOLOGY AND REMARKS. Termophilous to mesophilous species, living exclusively on trees or big bushes, particularly in ecotone habitats.

Meconema thalassinum (De Geer, 1773)

AVAILABLE DATA				
Val di Rose, Civitella Alfedena	1400	Abr	AQ	PF

GENERAL DISTRIBUTION. European species present from Central Europe to Central Italy (Abruzzo). In Italy it is less common than *M. meridionalis* but, due to its evasive behaviour, the presence is probably underestimated.

ECOLOGY AND REMARKS. Typical canopy species, living on trees of mesophilous woods. In PNALM it has been found only once under a very old beech (leg. C. Vivian).

Fam. Conocephalidae

Xiphidion discolor discolor (Thunberg, 1815)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF, PNA
Castel di Sangro		Abr	AQ	BO
Lago Castel S. Vincenzo	700	Mol	IS	PF
Zittola, Ponte-		Abr	AQ	LG
Pescasseroli, S.S. Marsicana Km 46	1160	Abr	AQ	PF

GENERAL DISTRIBUTION. Central-S Europe, Palearctic Asia and N Africa, widespread along the whole Italian peninsula, Sardinia and Sicily.

ECOLOGY AND REMARKS. Hygrophilous species, living on grasses and herbs. It often occurs in large and dense populations, as in the Sangro valley near Pesacsseroli.

Fam. Tettigoniidae

Tettigonia cantans (Fuessly, 1775)

AVAILABLE DATA				
Fonte di Pantano	1450	Abr	AQ	PF
Passo di Godi	1630	Abr	AQ	PF, PNA
Valle Profluo	1100	Abr		LG; LaGrMe82
Villetta Barrea	1100	Abr	AQ	LG

GENERAL DISTRIBUTION. Widely distributed, occurring from the W in the Pyrenees as far as Manciuria (China) to the East. In Europe it covers a wide area from Scandinavian peninsula to S Apennine (Italy).

ECOLOGY AND REMARKS. Mesophilous and montane to subalpine species, living in ecotone habitats or on tall herbs or small bushes in wild meadows: it is common on *Urtica dioica*. In PNALM it seems to prefer wet habitats.

Tettigonia viridissima Linnaeus, 1758

AVAILABLE DATA				
Alfedena	914	Abr	AQ	PT
Campomizzo, Ponte-		Abr	AQ	MVR
Castel di Sangro		Abr	AQ	BO
Colle della Croce, Barrea	1150	Abr	AQ	PF
M. Schiena Cavallo	1200	Abr	AQ	LG
Passo di Godi	1630	Abr	AQ	PF, PNA
Pescasseroli	1200	Abr	AQ	LG
Scanno	1900	Abr	AQ	LG
Serra del Monte	1600	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG
Villetta Barrea		Abr	AQ	Gtos15; PF

GENERAL DISTRIBUTION. Olopalearctic species, present in Italy everywhere.

ECOLOGY AND REMARKS. Mesoxerophilous species, living on tall herbs, bushes or even on the canopy of treees. In the PNALM it is a common species of the canopy of beech woods, where its its loud and unmistakeble song consent to detect it easily (Fontana et al., 2002).

Decticus albifrons (Fabricius, 1775)

AVAILABLE DATA				
Bisegna	1200	Abr	AQ	PF
Montagna di Godi	1700	Abr	AQ	LG, PF

GENERAL DISTRIBUTION. From Canary Islands (Atlantic Ocean, Spain) to S-W Asia, widespread in the Mediterranean basin, including Italy.

ECOLOGY AND REMARKS. Xerotermophilous species, living in dry and sunny habitas. The occurrence of this species on Montagna di Godi at 1700 m is remarkable.

Decticus aprutianus Capra, 1936

AVAILABLE DATA				
Aremogna, Rifugio-	1700	Abr	AQ	PF
M. Greco - Toppe del Tesoro	2100	Abr	AQ	PF, PNA, LG
Passo di Godi, Scanno	1500	Abr	AQ	PF
Pescasseroli	1600	Abr	AQ	LG
Piana di Aremogna	1700	Abr	AQ	PF
Piano di Terraegna	1350	Abr	AQ	LG; LaGrMe82
Roccaraso	1450	Abr	AQ	PF
Aremogna	1700	Abr	AQ	PF
Rif. Aremogna	1600	Abr	AQ	PF
Roccaraso, strada per Aremogna	1450	Abr	AQ	PF
Scanno		Abr	AQ	Capr36
Serra di Rocca Chiarano	1700	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Stazzo Affogata	1850	Abr	AQ	PT
Villetta Barrea	1700	Abr	AQ	LG

GENERAL DISTRIBUTION. Italian Apennine endemic species.

ECOLOGY AND REMARKS. Montane to alpine species, living on xeric high altitude meadows. *D. aprutianus* has often been considered as a subspecies of *D. verrucivorus* (Linnaeus, 1758) and sometimes its junior synonym. Fontana et al. (2001), on the basis of bioacoustic analysis, confirmed the identity of *D. aprutianus*. The type locality of this species is located within the PNALM ("mountains over Scanno" that may be supposed to be Mt Godi); this species is also very abundant on Mt Greco and on Aremogna upland. We would like to point out that in the PNALM a population of *D. aprutianus* lives in the same valley where is occurring its related species *D. v. verrucivorus*; this co-occurrence shows actual specific separation of them, in fact, they are well isolated by their different song (Fontana & Odè, in preparation).

Decticus verrucivorus verrucivorus Linnaeus, 1758

AVAILABLE DATA				
Frattura	1400	Abr	AQ	PF
M. Rotondo, Scanno		Abr	AQ	PF
Monte delle Vitelle, Pescasseroli		Abr	AQ	PF
Pescasseroli		Abr	AQ	PF
Rotondo, Monte- (Scanno-AQ)		Abr	AQ	PF
Scanno, Frattura, M. Ganzana	1400	Abr	AQ	PF

GENERAL DISTRIBUTION. Widely distributed from Europe to Caucasus and Siberia. In Italy it is common along Alps and widespread along Apennines as far as Mount Sirino (Basilicata Region) to the S.

ECOLOGY AND REMARKS. Montane to subalpine species, living in grassy meadows also intensively grazed. In the PNALM it lives at lower altitude than *D. aprutianus*, in less dry habitat.

Platycleis grisea grisea (Fabricius, 1781)

AVAILABLE DATA				
Alfedena		Abr	AQ	LaOs94
Barrea	1080	Abr	AQ	PT
Colle della Croce, Barrea	1150	Abr	AQ	PF
Costa delle Vitelle		Abr	AQ	LG; LaGrMe82
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Vivo, la Meta	1590	Abr	AQ	PF
M. Pietroso		Abr	AQ	LaGrMe82
M. Schiena Cavallo	1900	Abr	AQ	LG; LaGrMe82
Marsicano, Monte-	1800	Abr	AQ	LG
Montagna di Godi		Abr	AQ	LG; LaGrMe82, LaOs94
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1900	Abr	AQ	LG
Rif. Pesco Iorio	1850	Abr	AQ	LG; LaGrMe82; PF, PNA
Rocca di Cambio		Abr	AQ	LaGrMe82
Scanno	1900	Abr	AQ	LG
Schiena Cavallo, Monte-	1650	Abr	AQ	LaGrMe82
Serra del Monte		Abr	AQ	LG; LaGrMe82
Serra Fonte Leardi		Abr	AQ	LG; LaGrMe82
Valle Orsara	1550	Abr	AQ	LaGrMe82
Villetta Barrea		Abr	AQ	LaOs94

GENERAL DISTRIBUTION. From S Europe to S Russia; in Italy it is very common from the Alps to the Apennines, as well as in Sardinia and Sicily. In PNALM it is very common.

ECOLOGY AND REMARKS. Submontane to subalpine species, living in sunny and dry habitats from low to high altitudes. It lives often at the base of small bushes in open habitats or in ecotones. In subalpine localities it is very common on stony slopes, where it lives often with *Oedipoda germanica*. At higher altitudes it also occurs within *Juniperus* sp. bushes, together with *Eupholidoptera chabrieri chabrieri*.

Tessellana tessellata tessellata (Charpentier, 1825)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF, PNA
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago di Barrea Nord	971	Abr	AQ	PF
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Roccaraso	1450	Abr	AQ	PF
Roccaraso, strada per Aremogna	1450	Abr	AQ	PF
Villetta Barrea	1200	Abr	AQ	LG

GENERAL DISTRIBUTION. Olomediterranean species, occurring from Canary Islands (Atlantic Ocean, Spain) throughout N Africa and S Europe to Caucasus as far as to Iran. Widespread in Italy, where it is rare in the Alps (only few known localities), but very common along Apennines and in Sardinia and Sicily.

ECOLOGY AND REMARKS. Xerotermophilous species, typical of pseudosteppic habitats, living on grasses, herbs or small bushes. Quite common in the PNALM where it is a submontane to montane species.

Bicolorana bicolor bicolor (Philippi, 1830)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Passo di Godi	1630	Abr	AQ	PF
Roccaraso	1450	Abr	AQ	PF
Roccaraso, strada per Aremogna	1450	Abr	AQ	PF

GENERAL DISTRIBUTION. Euroasiatic species, distributed from France to Siberia and Mongolia; in Italy it covers East and W Alps and N, Central and S Apennines.

ECOLOGY AND REMARKS. Montane to subalpine (rarely submontane) species, mesohygrophilous, mostly occurring with dense populations. Its presence along the Apennines is scattered and only in the PNALM it seems to be quite common.

Sepiana sepium (Yersin, 1854)

AVAILABLE DATA				
Lago Castel S. Vincenzo	700	Mol	IS	PF

GENERAL DISTRIBUTION. S-European species, distributed from Spain to Greece, Caucasus and Middle Asia. Widespread in Italy, even if rare in the N, where it is known only from Liguria, Veneto and Friuli Venezia Giulia regions (Fontana et al., 2002).

ECOLOGY AND REMARKS. Xerotermophilous species living at the base of bushes or tall herbs and in ecotone habitats.

Pholidoptera fallax (Fischer, 1854)

AVAILABLE DATA				
Castel di Sangro		Abr	AQ	BO
Colle della Croce, Barrea	1150	Abr	AQ	PF
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago Vivo	1590	Abr	AQ	PF
Le Forme	1441	Mol	IS	PF
M. Prato Maiuri	1500	Abr	AQ	LG; LaGrMe82
M. Schiena Cavallo	1900	Abr	AQ	LG; LaGrMe82
Madonna di Tronchillo		Abr	AQ	LG; LaGrMe82
Montagna di Godi	1700	Abr	AQ	LG; LaGrMe82
Pantano, Fonte di-		Abr	AQ	PF
Monte Marsicano	1500	Abr	AQ	LG
Monte La Meta		Abr	AQ	PF, Ebn15a, LaOs94
Monte Prato Maiuri		Abr	AQ	LaGrMe82
Monte Schiena Cavallo		Abr	AQ	LaGrMe82
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Fonte Pantano		Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1000	Abr	AQ	LG; LaGrMe82
Rif. Pesco Iorio	1850	Abr	AQ	PF; LaGrMe82, LG
Rocca di Cambio		Abr	AQ	LaGrMe82
Rocca Pia, Pian Cinquemiglia, faggeta		Abr	AQ	LG
Roccaraso		Abr	AQ	LG; LaGrMe82
Scanno	1900	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
Tre Confini, Conca dell'Orso	1441	Mol	IS	PF
Val di Rose	1400	Abr	AQ	PNA
Valle Ciavolara	1500	Abr	AQ	LG; LaGrMe82
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Resione	1400	Abr	AQ	LG
Villetta Barrea	1400	Abr	AQ	LG

GENERAL DISTRIBUTION. European species occurring in S France, Italy, Austria, Slovakia, Balkanic Peninsula, Bulgaria and Romania as far as Turkey. In Italy it lives along the prealpine region, in the Apennines, Sardinia and Sicily.

ECOLOGY AND REMARKS. Xerotermophilous species in N Italy; in S Apennines it is frequently an orophilous and criophilous species, present at higher altitudes, where it lives on *Juniperus* sp. bushes, as in the Mount Pollino (Basilicata region). In the PNALM *P. fallax* is a montane to subalpine species, common at altitudes over 1600 m and living in small bushes in grazed meadows or subalpine grassland.

Pholidoptera griseoaptera (De Geer, 1775)

AVAILABLE DATA				
Montagna di Godi	1700	Abr	AQ	LG; LaGrMe82
Valle Resione	1400	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1400	Abr	AQ	LG

GENERAL DISTRIBUTION. Widely distributed all over Europe to Urals and Caucasus. In Italy it is common in the Alps and scattered along the Apennines to La Sila Mountains (Calabria region) and Sardinia island.

ECOLOGY AND REMARKS. Mesophilous species, sometimes mesohygrophilous in S Apennines. It lives in ecotone habitats, mainly on *Rubus* sp. bushes, often in dense populations.

Eupholidoptera chabrieri chabrieri (Charpentier, 1825)

AVAILABLE DATA				
Alfedena		Abr	AQ	Bacc58
Barrea	1080	Abr	AQ	PT
Civitella Alfedena		Abr	AQ	PF
Colle della Croce, Barrea	1150	Abr	AQ	PF
Lago Castel S. Vincenzo	700	Mol	IS	PF
Monte Marsicano	1500	Abr	AQ	LG
Monte Rotondo, Scanno		Abr	AQ	PF
Passo Cavulo-Val di Rose	1650	Abr	AQ	PF
Passo dell'Orso		Abr	AQ	LG; LaGrMe82
Pescasseroli	1650	Abr	AQ	LG
Pettorano sul Gizio900		Abr	AQ	PF
Ponte Zittola		Abr	AQ	LG
Rif. Pesco Iorio	1850	Abr	AQ	PF, PNA
Scanno	1600	Abr	AQ	LG
Serra del Monte		Abr	AQ	LG; LaGrMe82
Valle Ciavolara		Abr	AQ	LG; LaGrMe82
Valle di mezzo		Abr	AQ	Mas99
Valle Resione		Abr	AQ	LaGrMe82
Villetta Barrea	1400	Abr	AQ	LG

GENERAL DISTRIBUTION. From W Alps (France, Switzerland, Italy) to Garda Lake Eern bank and Central-S Apennines.

ECOLOGY AND REMARKS. Mesoxerophilous species in N Italy, it becomes more orophilous and criophilous in S Apennines, where its populations are characterised by small individuals with peculiar titillators. Apennine populations were indeed described by Targioni Tozzetti (1881) as a distinct species, named by him *Thamnotrizon brunneri*. Harz (1969) considered this taxon as subspecies of *E. chabrieri* (Charpentier, 1825) thus treating it as *Eupholidoptera chabrieri brunneri* (Targioni Tozzetti, 1881), combination adopted subsequently also by Otte (1997). La Greca (1959) and Baccetti (1959b) stated the synonymy *Thamnotrizon brunneri* = *E. chabrieri*; Massa (1999) confirmed this synonymy too, but recently M. La Greca reported to one of us (P.F.) the new opinion that he was convinced that *E. brunneri* could be a valid species. Further studies involving bioacoustic and molecular evidences as well are needed to establish definitely the taxonomic status of this species.

Yersinella raymondi (Yersin, 1860)

AVAILABLE DATA				
Settefrati	953	Laz	FR	PF

GENERAL DISTRIBUTION. N Mediterranean region, from Spain to Greece; quite common along the prealpine region and Italian peninsula, Sardinia and Sicily (Fontana et al., 2002).

ECOLOGY AND REMARKS. Mesotermophilous species, living on bushes or high herbs, often in ecotone habitats; in PNALM we found it on *Rubus* sp. In the italian tyrrhenian area and in Southern France (Fontana et al., 2002) also *Yersinella beybienkoi* La Greca, 1974 occurs; this species has been recorded on Gran Sasso Mountains (above Prati di Tivo, P.F.) but it seems not very common in Central and S Apennines.

Rhacocleis germanica (Herrich-Schaeffer, 1840)

AVAILABLE DATA				
Barrea	1080	Abr	AQ	PT
Settefrati	953	Laz	FR	PF

GENERAL DISTRIBUTION. From S Europe (S East France, Corsica, Italy, Balkanic peninsula) to Turkey. It has been recorded from the prealpine region, Italian peninsula and Sicily.

ECOLOGY AND REMARKS. Termophilous and ecotone species, living under trees or around and within bushes. In S Apennines *R. neglecta* (A. Costa, 1863) is clearly more common than *R. germanica* (Andreetti & Osella, 2001).

Saga pedo (Pallas, 1771)

AVAILABLE DATA				
Monte della Selva, galleria di Carrito	1200	Abr	AQ	PNA (not collected)

GENERAL DISTRIBUTION. From S-Central Europe to Siberia and Wern China. In Italy it is widespread from the prealpine region, along the peninsula, to Sardina and Sicily.

ECOLOGY AND REMARKS. Xerophilous species, in the N it lives in xerotermophilous habitats but generally it prefers dry, sunny and often stony habitats. It is one of the largest European insects and one of the very few Orthopteroid insects listed in the Appendixes of EC Habitat Directive 92/43; it also shows many interesting biological peculiarities (Fontana & Cussigh, 1996; Fontana et al., 2002). The presence of *Saga pedo* in the PNALM and in the surrounding areas is known only after that one specimen has been shown by a tourist in the "Centro Insetto" located at San Sebastiano. The habitat of the locality of this record should support the presence of a population of this species in the area.

Fam. Bradyporidae

Ephippiger cavannai (Targioni Tozzetti, 1881)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF, PT

GENERAL DISTRIBUTION. S Italy endemic species, known from Abruzzo to Calabria regions.

ECOLOGY AND REMARKS. Very peculiar species (La Greca, 1959), xerophilous to mesophilous, living from the sea level (Maratea, Basilicata region, P.F.) up to the montane level (M. Pollino, Rif. De Gasperi, 1500 m Basilicata region, P.F.; La Sila, M. Botte Donato, 1450 m, Calabria region, P.F.). Specimens of montane populations (including PNALM too) are small in size, while coastal population specimens are very large (almost the biggest *Ephippiger* in Italy). Morphological and bioacoustic observations (P. F.) confirm the belonging to the same species of these different populations.

Ephippiger ruffoi Galvagni, 1955

AVAILABLE DATA				
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF, PNA
Rocca di Cambio		Abr	AQ	LaGrMe82
Scanno	1800	Abr	AQ	LG
Serra dei Curti		Abr	AQ	LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LaGrMe82
Serra Rocca Chiarano		Abr	AQ	LG; LaGrMe82
Villetta Barrea	1700	Abr	AQ	LG

GENERAL DISTRIBUTION. Central Apennine endemic species.

ECOLOGY AND REMARKS. Montane to alpine species, living on pastures even intensively grazed, mainly occurring on *Juniperus* sp. small bushes or on high herbs like *Verbascum* sp.

Fam. Rhaphidophoridae

Dolichopoda geniculata (A. Costa, 1860)

AVAILABLE DATA				
Barrea	1080	Abr	AQ	PT
Opi (AQ)		Abr	AQ	Galv68a; BaCa69
Prato Rosso, Rifugio-	1600	Abr	AQ	Galv68a; BaCa59
Villetta Barrea		Abr	AQ	Galv68a; BaCa69

GENERAL DISTRIBUTION. Italian endemic species occurring in Central-S peninsula.

ECOLOGY AND REMARKS. Troglophilous species, living on the walls of natural caves, and in artificial caves or cellars. It may be frequently observed out of caves or cellars, mainly in beech underwood.

Fam. Gryllidae

Gryllus bimaculatus De Geer, 1773

AVAILABLE DATA				
Forca Resuni	1800	Abr	AQ	PT
Villetta Barrea		Abr	AQ	Gtos15

GENERAL DISTRIBUTION. S Europe, N Africa and Asia. In Italy it is widespread along the peninsula, in Sardinia, Sicily and many small isands; in N Italy it has been recorded only from Liguria region and Trieste province.

ECOLOGY AND REMARKS. Termophilous species, often anthropophilous. Long-winged individuals, very abundant in most populations, may fly away for kilometers, colonising new territories, before inhabited by this species; its presence at high altitude in the PNALM may be related to its active fly. It has also been recently found at high altitute in French Alps too, in the locality of Madonne de la Fenetre, Saint Martin Vesubie, 1950 m (Galvagni & Fontana, 2003).

Gryllus campestris Linnaeus, 1758

AVAILABLE DATA				
Fonte Difesa	1200	Abr	AQ	LaGrMe82
Lago Castel S. Vincenzo	700	Mol	IS	PF
Monte della Selva, galleria di Carrito	1200	Abr	AQ	PF (not collected)
Monte La Meta		Abr	AQ	LaOs94
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Ponte Campomizzo		Abr	AQ	MVR
Valle Fiorita	1350	Mol	IS	PT
Vastogirardi	1200	Mol	IS	LaGrMe82

GENERAL DISTRIBUTION. Central and S Europe; Mediterranean basin and Asia as far as Iran. It occurs in all regions of Italy.

ECOLOGY AND REMARKS. Mesotermophilous and geophilous species, living on sunny slopes with low grasses, even in intensively grazed pastures.

Eumodicogryllus burdigalensis burdigalensis (Latreille, 1804)

AVAILABLE DATA				
Lago di Castel San Vincenzo	700	Mol	IS	PF

GENERAL DISTRIBUTION. S Europe, Mediterranean basin to Afghanistan. It is wispread along all the Italian peninsula, in Sardinia and Sicily.

ECOLOGY AND REMARKS. Mesotermophilous species, living in stony and dry natural places, also frequent in cultivated fields and sometimes antropic places.

Pteronemobius concolor (Walker, 1871)

AVAILABLE DATA			
Lago di Castel San Vincenzo	700	Mol	IS PF

GENERAL DISTRIBUTION. S Europe, N Africa, S-W Asia, present everywhere in Italy.

ECOLOGY AND REMARKS. Hygrophilous species, living at the edge of lakes, ponds and ditches; it jumps into the water and actively swims on surface (Fontana et al., 2002).

Oecanthus pellucens pellucens (Scopoli, 1763)

AVAILABLE DATA			
Scanno	Abr	AQ	Ebn15

GENERAL DISTRIBUTION. Central-S Europe, Africa and Asia, everywhere present in Italy.

ECOLOGY AND REMARKS. Termophilous species, living on bushes or trees and high herbs.

Fam. Mogoplistidae

Mogoplistes brunneus Serville, 1839

AVAILABLE DATA				
Opi	1000	Abr	AQ	LG

GENERAL DISTRIBUTION. S Europe (France, Italy, Balkanic peninsula and Corfù), common in the Italian peninsula, Sardinia and Sicily; recorded in the N only from the Carso Triestino (Trieste province, Friuli Venezia Giulia region).

ECOLOGY AND REMARKS. Termophilous species living in the underwood of *Quercus* spp, included *Quercus ilex*.

Fam. Gryllotalpidae

Gryllotalpa gryllotalpa (Linnaeus, 1758)

AVAILABLE DATA			
Campomizzo, Ponte-	Abr	AQ	MVR
Pizzone	Mol	IS	PT
Villetta Barrea	Abr	AQ	Gtos15

GENERAL DISTRIBUTION. Central and S Europe, England. Few data are known from Italy, due to difficulties to morphologically identify taxa of this genus, which includes different sibling species.

ECOLOGY AND REMARKS. All *Gryllotalpa* are geophilous species, often abundant in wet lands. Among the 8 species occurring in Italy (identified mostly on the basis of chromosome differences) only *G. gryllotalpa* lives in the Central-S peninsula.

Fam. Tetrigidae

Paratettix meridionalis (Rambur, 1838)

Available data				
Lago di Castel San Vincenzo	700	Mol	IS	PF

General distribution. Mediterranean basin, Caucasus and Iran, widespread along Italian peninsula, Sardinia and Sicily.

Ecology and remarks. Like all Tetrigidae, hygrophilous and termophilous species.

Uvarovitettix depressus (Brisout, 1848)

Available data				
Canpitelli	1400	Abr	AQ	PF, PT
Lago Castel S. Vincenzo		Mol	IS	PF
Lago di Castel San Vincenzo	700	Mol	IS	PF
Opi		Abr	AQ	PF
Orso, Colle dell'- (AQ)	1672	Abr	AQ	PF
Pescasseroli		Abr	AQ	MVE
Valico dell'Orso	1672	Abr	AQ	PF

General distribution. S Europe, N Africa and Middle Asia, widespread along Italian peninsula and Sicily.

Ecology and remarks. Hygrophilous and termophilous species, quite common in the PNALM, also at high altitudes.

Tetrix bipunctata kraussi (Saulcy, 1888)

Available data				
Villetta Barrea		Abr	AQ	Gtos15; Bacc63b

General distribution. Alps, Italian and Balkanic peninsulas, known from the Italian Alps to Calabria region.

Ecology and remarks. Montane to subalpine taxon; in the Apennines, where it seems to be very rare, it lives in fresh habitats.

Tetrix subulata (Linnaeus, 1758)

Available data				
Castel di Sangro		Abr	AQ	BO
Godi, Monte-		Abr	AQ	Gtos15
Ortucchio	700	Abr	AQ	PF
Zittola, Ponte-		Abr	AQ	LG

General distribution. Holoarctic species, recorded along the whole Italian peninsula, Sardinia and Sicily.

Ecology and remarks. Mesohygrophilous species.

Fam. Acrididae

Italopodisma acuminata acuminata (La Greca, 1969)

AVAILABLE DATA				
Monte Greco		Abr	AQ	Gtos15
Monte Greco, Toppe del Tesoro	2000	Abr	AQ	PF, PNA
Pratello, Monte- (AQ)	1800	Abr	AQ	PF
Scanno	1900	Abr	AQ	MVR
Serra di Rocca Chiarano	1700	Abr	AQ	LG
Serra Fente Leonardi, Scanno	1900	Abr	AQ	LG, PF
Sparvera, Serra-		Abr	AQ	Galv73
Villetta Barrea	1700	Abr	AQ	LG

GENERAL DISTRIBUTION. Central Apennines endemic taxon, occurring only in the Eastern part of the PNALM mountains.

ECOLOGY AND REMARKS. All the taxa belonging to the genus *Italopodisma* Harz, 1973 are orophilous (eualpine) and mesophilous (La Greca & Messina, 1982), and live in alpine meadows or in stony slopes. They occur only in Central Apennine massives. Only one species or subspecies may occur on a single massive and only two species occur on more than one relief, namely *I. costai* (Targioni Tozzetti, 1881) and *I. fiscellana* (La Greca, 1954). *Peripodisma* Willemse, 1972, represented by only one extremely isolated species, *Peripodisma tymphii* Willemse, 1972, on Mt Tymphi (Pindo Mts, Greece), seems to be the European genus more related to *Italopodisma* (Fer Willemse, pers. comm.). *I. acuminata acuminata* is very abundant on Monte Greco, particularly in the loc. Toppe del Tesoro, where, with *Stenobothrus apenninus*, is the commonest Orthoptera species.

Italopodisma acuminata marsicana (La Greca, 1969)

AVAILABLE DATA				
M Capraro		Abr	AQ	PT
Marsicano, Monte-	1800	Abr	AQ	LG
Monte Palombo	1900	Abr	AQ	LG, MVR
Pescasseroli	1600	Abr	AQ	LG
Piano di Terraegna	1600	Abr	AQ	LG
Rifugio Prato Rosso		Abr	AQ	Galv73; MVR
Scanno		Abr	AQ	Bacc59
Serra del Monte	1800	Abr	AQ	LG
sotto Valico del Carapale sent. A4	1800	Abr	AQ	PF
Val di Corte	1400	Abr	AQ	PF
Valle Orsara	1800	Abr	AQ	LG

GENERAL DISTRIBUTION. Central Apennines endemic taxon, present only in the central range of the PNALM.

ECOLOGY AND REMARKS. It lives in the same habitats of the other taxa of this genus, but it seems to occur with less abundant populations.

Italopodisma fiscellana (La Greca, 1954)

AVAILABLE DATA				
Monte Cornacchia (Collimento-AQ)		Abr	AQ	LaGr69a
Monte Prato Maiuri	1850	Abr	AQ	LG; Galv73
Monte Schiena Cavallo	1900	Abr	AQ	LG, Galvagni 1973
Pescasseroli	1900	Abr	AQ	LG

GENERAL DISTRIBUTION. Central Apennines endemic taxon, present in different relieves, that is Gran Sasso, Reatini, Velino-Sirente, Simbruini, Sibillini Mts., and PNALM.

ECOLOGY AND REMARKS. It occurs in the same habitats of other taxa of the genus.

Italopodisma trapezoidalis aprutiana (La Greca, 1969)

AVAILABLE DATA				
Monte Marsicano		Abr	AQ	Galv73
Rif. Pesco di Iorio	1800	Abr	AQ	LG, PF, PNA
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF

GENERAL DISTRIBUTION. Central Apennines endemic taxon, present only on the central-western mountains of the PNALM.

ECOLOGY AND REMARKS. It occurs in the same habitats of other taxa of this genus, with small and very isolated populations.

Italopodisma trapezoidalis trapezoidalis (La Greca, 1969)

AVAILABLE DATA				
Barrea	1900	Abr	AQ	MVR
Camosciara	1700	Abr	AQ	Bacc91
Civitella Alfedena	1900	Abr	AQ	PF
Passo Cavulo, La Camosciara	1942	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
La Meta, Passo dei Monaci	1850	Mol	IS	PF
LagoVivo	1600	Abr	AQ	PF, PNA, LG; LaGr69
Mandra delle Vacche	1700	Abr	AQ	PF
Monte la Meta	1700	Abr	AQ	Galv73a; PT; Bacc59, PF; LaGr69
Passo dei Monaci	1850	Mo	IS	PF
Val di Rose, Forca Resuni	1900	Abr	AQ	PF, PT
Valle Lunga, Barrea	1900	Abr	AQ	LG, PF
Valle Resione	1400	Abr	AQ	LG
Villetta Barrea	1600	Abr	AQ	LG

GENERAL DISTRIBUTION. Central Apennines endemic taxon, present only on La Meta massif.

ECOLOGY AND REMARKS. Very abundant taxon, living in stony or dry meadows, also occurring in intensively grazed alpine pastures. In the locality Lago Vivo it is one of the commonest Orthoptera species.

Pezotettix giornai (Rossi, 1794)

AVAILABLE DATA				
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago di Barrea Nord	971	Abr	AQ	PF, PNA

GENERAL DISTRIBUTION. S Europe, N Africa, to East as far as to Caucasus. Recorded from all the Italian regions.

ECOLOGY AND REMARKS. Mainly termophilous, lowland to submontane species, living in dry, sunny and stony meadows, very scarce in the PNALM.

Calliptamus italicus italicus (Linnaeus, 1758)

AVAILABLE DATA				
Scanno		Abr	AQ	LG
Lago Castel S. Vincenzo	700	Mol	IS	PF
SS 158 Km 8		Mol	IS	PT
Villetta Barrea		Abr	AQ	Gtos15

GENERAL DISTRIBUTION. Widely distributed, occurring in continental Europe, Eastward to lake Baikal and Southward to Afghanistan. Common and widespread almost in all Italian regions.

ECOLOGY AND REMARKS. Mesoxerophilous species, living in dry, stony and sunny meadows, also frequent in montane habitats.

Calliptamus siciliae Ramme, 1927

AVAILABLE DATA				
Biscurri	1600	Abr	AQ	PT
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
Lago di Barrea Nord	971	Abr	AQ	PF
Monte Rotondo	1700-1800	Abr	AQ	PF, PNA
Frattura, M. Genzana (Scanno)	1400	Abr	AQ	PF

GENERAL DISTRIBUTION. Mediterranean basin, Ewards to Manciuria (China), known from almost all Italian regions.

ECOLOGY AND REMARKS. Mesoxerophilous species, living in dry meadows or in stony places, submomtane to montane, mainly in the Apennines.

Locusta migratoria cinerascens Fabricius, 1781

AVAILABLE DATA				
Valle Cupella	1600	Abr	AQ	PT

GENERAL DISTRIBUTION. S Europe, Asia and Africa. Solitary form is known from all the Italian regions.

ECOLOGY AND REMARKS. Mesotermophilous and hygrophilous species. Nymphs live usually in moderately wet habitats, while adults generally move to dry and sandy places, overwintering also in warmer sites.

Oedipoda caerulescens caerulescens (Linnaeus, 1758)

AVAILABLE DATA				
Alfedena	920	Abr	AQ	PT
Frattura, M. Genzana (Scanno)	1400	Abr	AQ	PF
Gioia Vecchio	1250	Abr	AQ	LG
Lago di Barrea Nord	971	Abr	AQ	PF, PNA
Lecce nei Marsi (AQ)	1540	Abr	AQ	MVR
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Godi		Abr	AQ	Gtos15
Monte Schiena Cavallo		Abr	AQ	LaGrMe82
Pesacasseroli	1250	Abr	AQ	LaGrMe82; PF
Villetta Barrea		Abr	AQ	Gtos15

GENERAL DISTRIBUTION. Europe, S-Western Asia and N Africa, widespread in Italy, islands included.

ECOLOGY AND REMARKS. Xerotermophilous and eliophilous species, living in stony or sandy places. Differently from the Alps, in central Apennine mountains it is less common than *O. germanica*.

Oedipoda germanica (Latreille, 1804)

AVAILABLE DATA				
Barrea	1090	Abr	AQ	PT
Civitella Alfedena	1300	Abr	AQ	PF
Frattura, M. Genzana (Scanno)	1400	Abr	AQ	PF
Gioia Vecchio	1100	Abr	AQ	LaGrMe82, LG
La Canala, Rif. Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Vivo	1590	Abr	AQ	PF
Montagna di Godi		Abr	AQ	LG; LaGrMe82
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Marsicano	1800	Abr	AQ	LG
Monte Rotondo	1700	Abr	AQ	PNA
Monte Palombo		Abr	AQ	LG; LaGrMe82
Monte Schiena Cavallo	1900	Abr	AQ	LG; LaGrMe82
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1500	Abr	AQ	LG; LaGrMe82
Rif. Pesco di Iorio	1800	Abr	AQ	LG, PF
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1600	Abr	AQ	LG

Serra del Monte		Abr	AQ	LG; LaGrMe82
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Val di Rose	1300	Abr	AQ	PF
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Orsara		Abr	AQ	LG; LaGrMe82

GENERAL DISTRIBUTION. S-W Europe and Middle Asia. In Italy it occurs along all the peninsula.

ECOLOGY AND REMARKS. It is less xerotermophilous than *O. caerulescens* and consequently more common in the high Apennine mountains; in the Alps known from few scattered localities.

Aiolopus strepens strepens (Latreille, 1804)

AVAILABLE DATA				
Lago di Castel San Vincenzo	700	Mol	IS	PF

GENERAL DISTRIBUTION. S Europe, Eastwards to Caucasus. Known from all Italian regions.

ECOLOGY AND REMARKS. Xerotermophilous and eliophilous species, living in bushy meadows or in dry and stony habitats; very rare in PNALM.

Paracinema tricolor bisignata (Charpentier, 1825)

AVAILABLE DATA			
Montenero Val Cocchiara	Mol	IS	LG
Ponte Zittola	Abr	AQ	LG

GENERAL DISTRIBUTION. S Europe, Eastwards to Caucasus and Middle Asia. In Italy it is recorded from almost all regions.

ECOLOGY AND REMARKS. Hygrophilous and termophilous species, living in high grasses near bogs and brackish habitats.

Omocestus rufipes (Zetterstedt, 1821)

AVAILABLE DATA				
Castel di Sangro		Abr	AQ	BO
Val Fondillo	1100	Abr	AQ	LG
Valle Aterno	1000	Abr	AQ	LG
Villetta Barrea		Abr	AQ	Gtos15

GENERAL DISTRIBUTION. Europe, Palearctic Asia and N Africa.

ECOLOGY AND REMARKS. Mesophilous species, occurring in many different habitats, from dry and sunny meadows to wet places; not very common in PNALM.

Dirshius haemorrhoidalis haemorrhoidalis (Charpentier, 1825)

AVAILABLE DATA				
Biscurri	1620	Abr	AQ	PT
Forca d' Acero	1500	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Vivo		Abr	AQ	LG, LaGrMe82, PF
Le Forme	1441	Mol	IS	PF
Madonna di Tronchillo	1550	Abr	AQ	LG; LaGrMe82
Montagna di Godi	1700	Abr	AQ	LG; LaGrMe82
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Meta	1590	Abr	AQ	PNA
Monte Palombo	1900	Abr	AQ	LG; LaGrMe82
Monte Prato Maiuri	1700	Abr	AQ	LG, LaGrMe82
Monte Schiena Cavallo (Pescasseroli)	1900	Abr	AQ	LaGrMe82, LG
Monte Marsicano	1800	Abr	AQ	LG
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Fonte Pantano		Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1600	Abr	AQ	LG
Pescasseroli-Opi, S.S. Marsicana Km 46	1150	Abr	AQ	PF
Piano Aremogna	1600	Abr	AQ	PF
Piano di Terraegna	1600	Abr	AQ	LG; LaGrMe82
Rif. Pesco di Iorio	1800	Abr	AQ	LG
Scanno	1600	Abr	AQ	LG; LaGrMe82
Serra del Monte	1600	Abr	AQ	LG; LaGrMe82
Serra di Rocca Chiarano	1700	Abr	AQ	LG; LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Val Fondillo	1100	Abr	AQ	LG; LaGrMe82
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Orsara	1800	Abr	AQ	LG; LaGrMe82
Valle Profluo		Abr	AQ	LG; LaGrMe82
Valle Resione	1400	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1700	Abr	AQ	LG

GENERAL DISTRIBUTION. Euroasiatic species widespread almost all over Europe, Siberia, Caucasus and Asia to Manciuria and Corea. In Italy it occurs from the Alps, along the peninsula, to Sila Mts (Calabria region).

ECOLOGY AND REMARKS. Mesophilous to termophilous species, usually living from submontane to alpine level; very common, often abundant, in central Apennine, as well as in PNALM.

Dirshius petraeus (Brisout, 1855)

AVAILABLE DATA				
Barrea Lago di Barrea		Abr	AQ	PF
Fiume Sangro		Abr	AQ	Gtos15
La Canala – Rif. Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
Lago di Barrea		Abr	AQ	PF
Monte Genzana	1400	Abr	AQ	PF
Monte Rotondo	1700-1800	Abr	AQ	PF, PNA
Piano Aremogna	1600	Abr	AQ	PF
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1600	Abr	AQ	LG
Monte Genzana, Frattura (Scanno)	1400	Abr	AQ	PF
Serra del Monte	1600	Abr	AQ	LG; LaGrMe82
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Valle Resione	1400	Abr	AQ	LG
Villetta Barrea	1400	Abr	AQ	LG

GENERAL DISTRIBUTION. Central and S Europe, Middle Asia, Caucasus, Kazakhstan and Siberia. In Italy it is widespread in the N, all along the peninsula and in Sardinia.

ECOLOGY AND REMARKS. Xerotermophilous species, living in steppic meadows and in stony habitats. In central Apennine it lives from submontane to high montane level.

Stenobothrus apenninus Ebner, 1915

AVAILABLE DATA				
Costa delle Vitelle	1900	Abr	AQ	LG; LaGrMe82
La Camosciara, Passo Cavulo	1942	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Madonna di Tronchillo		Abr	AQ	LaGrMe82
Monte Greco-Toppe del Tesoro	2000	Abr	AQ	PNA
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Greco		Abr	AQ	LG; LaGrMe82
Monte Greco - Toppe del Tesoro	2100	Abr	AQ	PF
Monte Palombo	1900	Abr	AQ	LG; LaGrMe82
Monte Petroso		Abr	AQ	LaGrMe82, LG
Monte Prato Maiuri		Abr	AQ	LaGrMe82, LG
Monte Schiena Cavallo		Abr	AQ	LaGrMe82
Monte Marsicano	1800	Abr	AQ	LG
Monte Meta		Abr	AQ	Galv71, Ebn15, LG
Monte Schiena Cavallo	1860	Abr	AQ	LG
Pescasseroli	1600	Abr	AQ	LG
Piano di Terraegna	1600	Abr	AQ	LG; LaGrMe82
Pianoro Campitelli	1400	Abr	AQ	PT
Rifugio Pesco di Iorio	1800	Abr	AQ	LG, PF
Scanno	1900	Abr	AQ	LG
Serra di Rocca Chiarano		Abr	AQ	LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF

Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Lunga (Barrea)		Abr	AQ	LG; LaGrMe82
Valle Orsara (Monte Marsicano)	1800	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1900	Abr	AQ	LG

GENERAL DISTRIBUTION. Italian Apennine endemic species, known from the Tosco-Emiliano Apennine to the Pollino Mountains (Calabria region).

ECOLOGY AND REMARKS. Mesophilous and montane to alpine species, living in steppic meadows or in stony habitats. It is often present with dense populations, characterised by high chromatic variability.

Stenobothrus lineatus lineatus (Panzer, 1796)

AVAILABLE DATA				
Colle della Croce, Barrea	1150	Abr	AQ	PF
Frattura	1400	Abr	AQ	PF
Forca d'Acero	1500	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago di Barrea		Abr	AQ	PF
Lago Montagna Spaccata	1050	Abr	AQ	PT
Lago Vivo	1600	Abr	AQ	LG; LaGrMe82
Madonna di Tronchillo	1550	Abr	AQ	LG; LaGrMe82
Montagna di Godi	1700	Abr	AQ	LG; LaGrMe82, LaOs94
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Genzana, Frattura (Scanno)	1400	Abr	AQ	PF
Monte Marsicano	1500	Abr	AQ	LG
Monte Pietroso	1750	Abr	AQ	LG
Monte Petroso		Abr	AQ	LaGrMe82
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF, PNA
Pescasseroli		Abr	AQ	MVE
Piano Aremogna	1600	Abr	AQ	PF
Rifugio Pesco di Iorio	1800	Abr	AQ	LG; LaGrMe82
Scanno	1900	Abr	AQ	LG
Serra Fonte Leonarardi	1900	Abr	AQ	LG, PF
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Valle Ciavolara	1500	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1600	Abr	AQ	LG

GENERAL DISTRIBUTION. Central and S Europe, Eastwards to Siberia and Mongolia. In Italy it is well distributed in the Alps, Apennines and has also been recorded from Sardinia (Gennargentu Mts) and Sicily (Etna).

ECOLOGY AND REMARKS. Mesoxerophilous species, living in grasslands from submontane to alpine level.

Stenobothrus nigromaculatus nigromaculatus (Herrich-Schaeffer, 1840)

AVAILABLE DATA				
Monte Greco	2000	Cal	CS	LG
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Piano Aremogna	1600	Abr	AQ	PF, PNA
Scanno	1900	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG

GENERAL DISTRIBUTION. Eurosibiric species, known from Europe to central and N Asia. In Italy it is scattered along Alps and Apennines.

ECOLOGY AND REMARKS. Mesoxerophilous species, living from montane to alpine meadows.

Aeropus sibiricus sibiricus (Linnaeus, 1758)

AVAILABLE DATA				
Biscurri	1600	Abr	AQ	PT
La Camosciara		Abr		Bacc91
La Camosciara, Passo Cavulo	1942	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Vivo	1590	Abr	AQ	PF
Madonna di Tronchillo	1550	Abr	AQ	LG
Meta, Monti della-		Abr	AQ	LaGrMe82
Montagna di Godi	1700	Abr	AQ	LG; LaGrMe82, Galv71
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Greco	1900-2000	Abr	AQ	LG; LaGrMe82
Monte Marsicano	1800	Abr	AQ	LG
Monte Palombo	1900	Abr	AQ	LG; LaGrMe82
Monte Petroso	1750	Abr	AQ	LG
Monte Prato Maiuri	1700	Abr	AQ	LaGrMe82, LG
Monte Schiena Cavallo	1860	Abr	AQ	LaGrMe82, LG
Monte Tronchillo	1750	Abr	AQ	LG
Passo dell'Orso	1650	Abr	AQ	LG
Passo di Godi	1630	Abr	AQ	PF
Pescasseroli	1750	Abr	AQ	LG
Piano di Terraegna	1600	Abr	AQ	LG; LaGrMe82
Rif. Pesco Iorio	1800	Abr	AQ	PF, PNA, LG, LaGrMe82
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1550-1900	Abr	AQ	LG; LaGrMe82
Schiena Cavallo, Monte-		Abr	AQ	La Greca et al.,1982
Serra del Monte	1800	Abr	AQ	LG; LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LaGrMe82, LG
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Lunga	1900	Abr	AQ	LG; LaGrMe82
Valle Orsara	1550-1800	Abr	AQ	LG; LaGrMe82
Villetta Barrea		Abr	AQ	Galv71

GENERAL DISTRIBUTION. From European Mountains to China. In Italy it is known from Alps to Mt Pollino (Calabria region).

ECOLOGY AND REMARKS. Boreo-alpine species, living from montane to alpine meadows, often abundant; it is very common in PNALM.

Gomphocerus rufus (Linnaeus, 1758)

AVAILABLE DATA			
Parco Nazionale d'Abruzzo,	Abr	AQ	Ebn15, LaOs94

GENERAL DISTRIBUTION. Widespread from Europe to China. In Italy very common along the Alps, Apennines, also recorded from Sardinia.

ECOLOGY AND REMARKS. Ecotone species, living frequently under the shadow of isolated trees or along wood edges. Quite common in the Apennines, its presence in the PNALM is due only to the old record of Ebner (1915).

Myrmeleotettix maculatus maculatus (Thunberg, 1815)

AVAILABLE DATA				
Costa delle Vitelle	1900	Abr	AQ	LG; LaGrMe82
Montagna di Godi		Abr	AQ	Galv71
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Marsicano	1800	Abr	AQ	LG
Monte Palombo	1900	Abr	AQ	LG; LaGrMe82
Monte Petroso	1750	Abr	AQ	LG; LaGrMe82
Monte Prato Maiuri	1700	Abr	AQ	LG; LaGrMe82
Monte Rotondo	1700-1800	Abr	AQ	PF
Monte Schiena Cavallo	1900	Abr	AQ	LG, LaGrMe82
Pescasseroli	1600	Abr	AQ	LG
Piano Aremogna	1600	Abr	AQ	PF
Piano di Terraegna	1600	Abr	AQ	LG; LaGrMe82
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF, PNA
Scanno	1900	Abr	AQ	LG
Serra del Monte	1800	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle Orsara	1800	Abr	AQ	LG; LaGrMe82
Villetta Barrea		Abr	AQ	Galv71

GENERAL DISTRIBUTION. Widely distributed from Europe to Siberia. In Italy it is widespread in the Alps, Apennines and Sicily (Madonie Mts).

ECOLOGY AND REMARKS. In the Apennines it is a xerotermophilous and orophilous species, living in dry and stony habitats, usually over 1500 m.

Stauroderus scalaris scalaris (Fischer Waldheim, 1846)

AVAILABLE DATA				
Biscurri	1600	Abr	AQ	PF, PT
Colle della Croce, Barrea	1150	Abr	AQ	PF
Forca d'Acero	1500	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
Lago Vivo	1600	Abr	AQ	LG, PNA, PF; LaGrMe82
Montagna di Godi	1700	Abr	AQ	LG
Monte delle Vitelle, Pescasseroli	1600	Abr	AQ	PF
Monte Greco, Toppe del Tesoro	2100	Abr	AQ	PF
Monte Marsicano	1500	Abr	AQ	LG
Monte Palombo	1900	Abr	AQ	LG
Monte Petroso	1750	Abr	AQ	LG
Passo dell'Orso	1650	Abr	AQ	PF, LG
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Fonte Pantano		Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1650	Abr	AQ	LG
Piano Aremogna	1600	Abr	AQ	PF
Canale Profluo		Abr	AQ	LaGrMe82
Rifugio Pesco Iorio	1850	Abr	AQ	PF
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1900	Abr	AQ	LG
Serra del Monte	1600	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Toppe del Tesoro	2100	Abr	AQ	PF
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle Ciavolara	1500	Abr	AQ	LG
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Profluo	1100	Abr	AQ	LG
Valle Resione	1400	Abr	AQ	LG
Villetta Barrea	1400	Abr	AQ	LG

GENERAL DISTRIBUTION. European Mountains Eastwards to Mongolia. In Italy it is widespread in the Alps, as well as along the peninsula.

ECOLOGY AND REMARKS. Mesophilous to mesohygrophilous and montane to alpine species, living in grasslands, often with dense populations.

Chorthippus bruttius Fontana & La Greca, 1999

AVAILABLE DATA				
Lago Vivo	1600	Abr	AQ	LG
Monte della Corte		Abr	AQ	Bacc58d
Monte Prato Maiuri (Pescasseroli)	1700	Abr	AQ	LG
Pescasseroli	1000	Abr	AQ	LG, Bacc58
Pescasseroli, S.S. Marsicana Km 46	1160	Abr	AQ	PF
Villetta Barrea	1600	Abr	AQ	LG

GENERAL DISTRIBUTION. Italian Apennine endemic species, known from central Appennine to La Sila Mountanis.

ECOLOGY AND REMARKS. Hygrophilous montane species, living in meadows around wet habitats or in wet meadows. Bioacoustics and morphology of the population near Pescasseroli, in PNALM, studied by one of us (P. F.), showed small differences from the topotypical population illustrated by Fontana & La Greca (1999b).

Chorthippus dorsatus dorsatus (Zetterstedt, 1821)

AVAILABLE DATA				
Castel di Sangro		Abr	AQ	LG
Colle della Croce, Barrea	1150	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
Lago di Barrea		Abr	AQ	PF
Le Forme	1441	Mol	IS	PF
Le Prate di Lecce	1540	Abr	AQ	PF
Lecce nei Marsi (rovine-AQ)	1540	Abr	AQ	PF
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Piano Aremogna	1600	Abr	AQ	PF, PNA
Pianoro Campitelli	1400	Abr	AQ	PT
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1600	Abr	AQ	LG
Val Fondillo	1100	Abr	AQ	LG

GENERAL DISTRIBUTION. Continental Europe to Siberia. In Italy the typical subspecies is known from the Alps to Central Apennine and Sardinia (Gennargentu Mts); *C. dorsatus garganicus* has also been recorded in Southern Italy, but the identity of these populations have to be furtherly investigated.

ECOLOGY AND REMARKS. *C. d. dorsatus* is a meso-hygrophilous species, living in fresh meadows and in wet habitats. It is a montane species quite common in PNALM.

Chorthippus parallelus parallelus (Zetterstedt, 1821)

AVAILABLE DATA				
Castel di Sangro		Abr	AQ	LG
Colle della Croce, Barrea	1150	Abr	AQ	PF
Fonte Pantano	1400	Abr	AQ	PF
Lago Vivo	1591	Abr	AQ	PF, PNA
Le Forme	1441	Mol	IS	PF
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1000	Abr	AQ	LG
Scanno	1600	Abr	AQ	LG
Serra del Monte	1600	Abr	AQ	LG
Settefrati	953	Laz	FR	PF
Val Fondillo		Abr	AQ	PF; Gtos15
Valle Profluo	1100	Abr	AQ	LG
Valle Resione	1400	Abr	AQ	LG
Villetta Barrea	1100	Abr	AQ	LG

GENERAL DISTRIBUTION. From Europe to Siberia. In Italy is known from almost all regions.

ECOLOGY AND REMARKS. Meso-hygrophilous to hygrophilous montane species, mainly in the Apennines. In PNALM it usually occurs in wet habitats.

Italohippus monticola Ebner, 1915

AVAILABLE DATA				
Monte Marsicano	1800	Abr	AQ	LG
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Rotondo	1700-1800	Abr	AQ	PF, PNA
Passo dei Monaci	1900	Abr	AQ	PT
Pescasseroli	1800	Abr	AQ	PF
Rif. Pesco Iorio	1800	Abr	AQ	PF
Scanno	1800	Abr	AQ	LG
Serra del Monte	1800	Abr	AQ	LG; LaGrMe82
Serra di Rocca Chiarano	1700	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
Serra Rocca Chiaiano		Abr	AQ	LaGrMe82
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Valle Orsara	1700-1800	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1700	Abr	AQ	LG

GENERAL DISTRIBUTION. Italian Apnennine endemic species belonging to an Italian Apennine endemic genus (Fontana & La Greca, 1999a).

ECOLOGY AND REMARKS. Xerophilous and orophilous species, living in the alpine level, in dry and stony meadows. Identity of the populations of the genus *Italohippus* Fontana & La Greca, 1999 of PNALM is not clear, and bioacoustics as well as morphological differences between them and the topotypical ones (Gran Sasso Mts) are in progress by one of us (P. F.).

Glyptobothrus brunneus brunneus (Thunberg, 1815)

AVAILABLE DATA				
La Camosciara, Passo Cavulo, la Meta	1942	Abr	AQ	PF
La Meta, Biscurri, Fortino (Dir.)	1600-1850	Abr	AQ	PF, PT
Lago di Barrea Nord	970	Abr	AQ	PNA
Lago Vivo	1600	Abr	AQ	LG; LaGrMe82
Monte Greco, Toppe del Tesoro	2100	Abr	AQ	PF, LaGrMe82
Monte Godi		Abr	AQ	LaGrMe82
Monte Marsicano		Abr	AQ	LaGrMe82
Monte Prato Maiuri		Abr	AQ	LaGrMe82
Monte Schiena Cavallo	1860	Abr	AQ	LG; LaGrMe82
Madonna di Tronchillo	1550	Abr	AQ	LG; LaGrMe82
Monte Petroso	1750	Abr	AQ	LG; LaGrMe82
Opi	1000	Abr	AQ	LG

Passo di Godi	1630	Abr	AQ	PF
Pescasseroli	1860	Abr	AQ	LG; LaGrMe82
Rifugio Aremogna	1700	Abr	AQ	PF
Rif. Pesco Iorio	1800	Abr	AQ	PF, LG; LaGrMe82
Scanno	1600	Abr	AQ	LG
Scanno		Abr	AQ	LaGrMe82
Serra del Monte	1600	Abr	AQ	LG; LaGrMe82
Serra Fonte Leardi	1900	Abr	AQ	LG; LaGrMe82
Valle dell'Inferno, sent. B4	1600	Abr	AQ	PF
Valle Lunga	1900	Abr	AQ	LG; LaGrMe82
Villetta Barrea	1600	Abr	AQ	LG

GENERAL DISTRIBUTION. Europe and Palearctic Asia (probably most old records have to be referred to other related taxa, like *G. bornhalmi* Harz, 1971). In Italy it is common everywhere along the peninsula and Sardinia, while in Sicily, S Calabria (Aspromonte Mts) and Eolian Is. (Filicudi) (P. Fontana, pers. obs.) nominal subspecies is replaced by *G. brunneus raggei* La Greca et al., 2000.

ECOLOGY AND REMARKS. In N Italy *G. b. brunneus* is a meso-termophilous species, commonly occurring from the lowland up to submontane and montane levels; in central Appennines it is usually a montane to alpine taxon, very common in dry meadows or in stony habitats.

Glyptobothrus rubratibialis Schmidt, 1978

AVAILABLE DATA				
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
Lago di Barrea Nord	971	Abr	AQ	PF
Lago Vivo	1600	Abr	AQ	LG
Le Forme	1441	Mol	IS	PF
M Rotondo	1880	Abr	AQ	PNA
M. Greco	2000	Abr	AQ	LG
M. Prato Maiuri	1700	Abr	AQ	LG
M. Rotondo	1700-1800	Abr	AQ	PF
Montagna di Godi	1700	Abr	AQ	LG
Monte delle Vitelle, Pescasseroli	1800	Abr	AQ	PF
Monte Genzana, Frattura (Scanno)	1400	Abr	AQ	PF
Monta Greco	2000	Abr	AQ	LG
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Pescasseroli	1500-1700	Abr	AQ	LG
Piano Aremogna	1600	Abr	AQ	PF
Rifugio Pesco di Iorio	1800	Abr	AQ	LG
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1900	Abr	AQ	LG
Serra Fonte Leardi	1900	Abr	AQ	LG
sotto Valico del Campitello, sent. A4	1800	Abr	AQ	PF
Tre Confini, Conca dell'Orso	1650	Abr	AQ	PF
Val di Rose	1300	Abr	AQ	PF

Valle Cupella	1700	Abr	AQ	PT
Valle Orsara	1800	Abr	AQ	LG
Villetta Barrea	1600	Abr	AQ	LG
Villetta Barrea		Abr	AQ	Gtos15

GENERAL DISTRIBUTION. Italian Apennine endemic species, in the past recorded *G. mollis* (Charpentier, 1825).

ECOLOGY AND REMARKS. Mesotermophilous montane to alpine species, living in dry and stony meadows, often very abundant and very common in central Apennines, particularly in PNLM mountains.

Glyptobothrus vagans vagans (Eversmann, 1848)

AVAILABLE DATA				
Pescasseroli, Mandrella, sentiero Z1	1300	Abr	AQ	PF

GENERAL DISTRIBUTION. Europe, Ewards to S Russia, Kazakhstan and middle Asia. In Italy it is known from N all over the peninsula.

ECOLOGY AND REMARKS. Xerotermophilous species, occurring from the sea level up to mountains. It lives usually under the shadow of isolated trees or in clearings of sparse woods. In the only known locality of PNALM it lives under trees in dry and partially stony meadows.

Euchorthippus declivus (Brisout, 1848)

AVAILABLE DATA				
Alfedena		Abr	AQ	LaOs94
Colle della Croce, Barrea	1150	Abr	AQ	PF
Fondillo, Valle di-	1100	Abr	AQ	LG
Forca d' Acero	1500	Abr	AQ	PF
La Canala - Rifugio Prato Rosso, sent. A1	1400-1450	Abr	AQ	PF
La Meta, Biscuri, Fortino (Dir.)	1750-1850	Abr	AQ	PF
Lago Castel S. Vincenzo	700	Mol	IS	PF
Lago di Barrea Nord	971	Abr	AQ	PF
Le Forme	1441	Mol	IS	PF
Monte Genzana, Frattura (Scanno)	1400	Abr	AQ	PF
Passo di Godi	1630	Abr	AQ	PF
Passo di Godi, Stazzo Bocca di Pantano	1580	Abr	AQ	PF
Piano Aremogna	1600	Abr	AQ	PF
Rifugio Prato Rosso	1536	Abr	AQ	PNA
Rifugio Prato Rosso, sent. A1	1536	Abr	AQ	PF
Scanno	1600	Abr	AQ	LG
Scanno		Abr	AQ	LaOs94
Val Fondillo	1100	Abr	AQ	LG; LaGrMe82
Valle Cupella	1650	Abr	AQ	PT
Villetta Barrea		Abr	AQ	LaOs94

GENERAL DISTRIBUTION. From Spain to Ukraine. In Italy it is known almost for all regions, where is very common.

ECOLOGY AND REMARKS. Xerotermophilous species, living from the lowland to montane level. It lives in dry and often stony meadows. In central Apennine it is more common from montane to subalpine levels (Fontana et al., 2002).

Ord. PHASMATODEA

Fam. Bacillidae

Bacillus rossius rossius (Rossi, 1788)

AVAILABLE DATA				
Lago Castel S. Vincenzo	700	Mol	IS	PF

GENERAL DISTRIBUTION. Mediterranean species; the distribution of the typical subspecies, as well as that of related taxa, is not still well known.

ECOLOGY AND REMARKS. Xerotermophilous species, living from lowland to submontane level. In PNALM only two males were collected, showing that an amphigonic population occurs in this area.

Clonopsis gallica (Charpentier, 1825)

AVAILABLE DATA				
Lago Castel S. Vincenzo	700	Mol	IS	PF
Colle della Croce E, Alfedena	1100	Abr	AQ	PF

GENERAL DISTRIBUTION. Mediterranean Basin. In Italy it is widespread along all the peninsula, in Sardinia and Sicily (Fontana et al., 2002).

ECOLOGY AND REMARKS. Xerotermophilous species, living from the lowland to montane level. In PNALM it is apparently more common, and probably less xerophilous, than *B. r. rossius*. Only females were collected in PNALM.

Ord. DERMAPTERA

Fam. Anisolabidae

Euborellia moesta (Gené, 1837)

AVAILABLE DATA			
Castelnuovo, presso Avezzano	Abr	AQ	LaGral97
Montalto	Mol	Is	Stei79
Pettorano sul Gizio	Abr	AQ	VTAip
Vittorito, valle dell'Aterno	Abr	AQ	VTAip

GENERAL DISTRIBUTION. Mediterranean species, mostly distributed in western regions. It is present from Iberian to Balkanic peninsulas, and it is common in Tyrrhenian islands and Italy, particularly along western coasts.

ECOLOGY AND REMARKS. Termophilous species, common in Mediterraean habitats, and also present in Prealpine and Appenninic xerothermic habitats. Up to now it is known only for the surrounding protection area of the PNALM.

Fam. Labiidae

Labia minor (Linnaeus, 1758)

AVAILABLE DATA			
Rifugio Pratorosso	Abr	AQ	Stei79
Trasacco, fucino	Abr	AQ	Macc33

GENERAL DISTRIBUTION. Almost cosmopolitan species, widespread in Mediterranean regions, as Italy, where it is considered an uncommon species.

ECOLOGY AND REMARKS. Common on dung-hills; it may actively fly and it is often collected at light.

Fam. Forficulidae

[*Anechura bipunctata* (Fabricius, 1781)]

No available data

GENERAL DISTRIBUTION. Steppic species, widely scattered from Europe to Asia: its distribution is discontinuous along the Alpine-Hymalaian chain, from Cantabric Mountains and Pyrenees to Mongolia.

ECOLOGY AND REMARKS. According to Vigna Taglianti (in Failla et al., 1994), *A. bipunctata* was recorded only from N Italy, where it lives in montane level (upper montane level) of Alps (Piedmont, Valle D'Aosta and Lombardy); more recently, Vigna Taglianti (1999) recorded it from Apennines, on Gran Sasso Mts, where, on Monte Corvo, a small population lives. We also have to point out that the record reported by Steinmann (1979) from the PNALM ("N of Barrea on the banks of the Sangro river"), based on 3 females of the Museo zoologico "La Specola" in Florence, is due to a misidentification. In fact, one of us (A. V. T.), cheking these specimens (labelled "Parco N.le Abruzzo, a N di Barrea sulle rive del Sangro, 10.VII.1963, A. Martelli leg. - *Anechura bipunctata* Fabricius, det. Dr. H. Steinmann - "La Specola" Firenze 0434"), was able to establish they are nymphs of *Forficula auricularia* Linnaeus, 1758 (Vigna Taglianti, 1999). It seems to be absent from other Apennine relievs.

Pseudochelidura orsinii (Gené, 1833)

AVAILABLE DATA				
Alfedena		Abr	AQ	Macc33
Campomizzo	1200	Abr	AQ	VT
Lago Vivo	1600	Abr	AQ	PF, VT
M. Greco	2000-2280	Abr	AQ	PF, VT, Macc33
M. Greco, Toppe del Tesoro	2100	Abr	AQ	PF
Monta Iamiccio		Abr	AQ	Gtos15, Macc33
Montagna di Godi		Abr	AQ	Gtos15, Macc33
Monte Capraro, Passo Cavuto	1950	Abr	AQ	VT
Monte Marsicano, circo glaciale	2050	Abr	AQ	VT
Monte Marsicano, cresta N	2200	Abr	AQ	VT
Monte Meta		Abr	AQ	IEB, Ebn15
Monte Meta, conca de i Biscurri	1900	Abr	AQ	VT
Monte Greco, Lago Pantaniello	1900	Abr	AQ	VT
Monte Greco, Stazzo Il Prato	2000	Abr	AQ	VT
Monte Palombo	1600-1900	Abr	AQ	VT
Monte Tranquillo	1800	Abr	AQ	VT
Padule Campomizzo-Le Prata di Gioia		Abr	AQ	MVR
Pescasseroli		Abr	AQ	IEB, MZUR, VT
Piana di Lecce dei Marsi	1540	Abr	AQ	MVR
Rif. Pesco Iorio	1800	Abr	AQ	PF
Val Fondillo		Abr	AQ	PF
Val Resione (= Valle dell'Inferno)	1300-1500	Abr	AQ	VT
Valle di Fonte d'Appia	1600	Abr	AQ	VT
Villetta Barrea		Abr	AQ	Gtos15, Macc33

GENERAL DISTRIBUTION. Apennine endemic species, distributed from Central-N Apennines (Frignano, Modena province) and from Alpi Apuane to Matese Mts in the S. It also occurs in two localities out of the Apennines, in the Alpes-Maritimes (Colle di Tenda, France) (Vigna Taglianti, 1973, 1994, 1999) and in the Venetian Prealps (Lessini Veronesi, Val di Squaranto) (Galvagni & Fontana, 1993), where it seems not related to an anthropic introduction.

ECOLOGY AND REMARKS. Montane species, present from the lower montane level in the beech clearings to the upper montane level in pseudo-alpine grasslands.

Apterygida albipennis (Megerle in Charpentier, 1825)

AVAILABLE DATA				
Corfinio		Abr	AQ	VT
Pratola Peligna		Abr	AQ	VT
Palude La Zittola, Montenero Val Cocchiara	750-850	Mol	IS	BO, VT
Vallre del Giovenco, Cesoli	650-800	Abr	AQ	BO, VT
V. San Giovanni di Bisegna		Abr	AQ	BO

GENERAL DISTRIBUTION. European species, distributed from Spain to Greece, Northwards to Lithuania and Great Britain. It is well distributed in Italy along the Alps and in the

Prealpine area; it is also present in several Apennine localities, where it should be considered as a mesophilous relict. In the Apennines it is known from Reatini and La Laga Mts (Andreetti & Osella, 2001) and from several localities of L'Aquila province (Vigna Taglianti, in press); in the S its distribution is more continuous up to the Matese Mts, while only isolated populations are known from Gargano and Monte Pollino (Targioni Tozzetti & Stefanelli, 1882).

ECOLOGY AND REMARKS. It lives particularly on bushes or small trees (Fontana et al., 2002).

Forficula auricularia Linnaeus, 1758

AVAILABLE DATA

Barrea, rive del Fiume Sangro		Abr	AQ	MZUF, Stei79 (sub *A. bipunctata*)
La Meta		Abr	AQ	Ebn15
Lago di Barrea	990	Abr	AQ	VT
Lago Pantaniello	1900	Abr	AQ	VT
Lago Vivo, la Meta	1600	Abr	AQ	PF, VT
Monte Greco, Serra delle Gravare	1990-2100	Abr	AQ	VT
Monte Petroso	1900	Abr	AQ	BO
Montenero Val Cocchiara, Palude La Zittola	850	Mol	IS	BO
Opi, Torrente Sangro	1100	Abr	AQ	VT
Padule Campomizzo, Le Prata di Gioia	1200	Abr	AQ	MVR, VT
Pescasseroli		Abr	AQ	MVR
Rif. Pesco Iorio	1800	Abr	AQ	PF
Rif. Prato Rosso, sentiero A1	1536	Abr	AQ	PF
Serra Bocca Chiarano, Stazzo il Prato	2000	Abr	AQ	VT
Terraegna dint.	1600	Abr	AQ	VT
Val Fondillo	1200	Abr	AQ	Gtos15, Borr16, Crav18, Macc33, V
Villetta Barrea		Abr	AQ	Gtos15, Borr16, Crav18, Macc33
Villetta Barrea, Il Formale, Fiume Sangro	1050	Abr	AQ	VT

GENERAL DISTRIBUTION. Cosmopolitan species of Asiatic-European origin, widespread in Italy, in large islands and in some small islands (Vigna Taglianti, 1995).

ECOLOGY AND REMARKS. In central Apennine it is common in several habitats, mainly in steppic ones, at high altitude too. It is very abundant in the PNALM.
Borelli (1916), described as "*Forficula abrutiana* n. sp." two specimens collected in the PNALM (Val Fondillo, Villetta Barrea; type material preserved in the Museo Regionale di Scienze Naturali of Turin). Same data are reported by Cravero (1918) and Maccagno (1933), while *Forficula abrutiana* Borelli is considered a junior synonym of *F. auricularia* Linnaeus, 1758 (Vigna Taglianti in Failla et al., 1994); notwithstanding, the former taxon is considered as valid species in recent papers, as Harz & Kaltenbach (1976) (they also report that the type material is unknown ("unbekannt"): Vigna Taglianti, 1978), and Steinmann (1993) (who reports that the taxon was described from "unknown locality").

Forficula decipiens Gené, 1832

AVAILABLE DATA				
Villetta Barrea	1000	Abr	AQ	PF

GENERAL DISTRIBUTION. Widespresad in S Europe and N Africa; it is more frequent in western and tyrrhenian regions, even if also present along Adriatic coasts in Dalmatia (Us e Matvejev, 1967). Described from the Apennine, Liguria region, *F. decipiens* is widely distributed in Italy along the peninsula, the main islands and smaller islands, where it is often the only Dermaptera present (Vigna Taglianti, 1975).

ECOLOGY AND REMARKS. Mediterranean termophilous species, living from the coast up to the mountains (Fontana et al., 2002). Anthropophilous species, its presence in the PNALM is known only for the village of Villetta Barrea. The record reported by Steinmann (1979) for the "top of M.te Maielletta" (2 females, leg. Cavanna, 1878, MZUF) have probably to be referred to a different species (presumably *Pseudochelidura orsinii*).

Forficula obtusangula Krauss, 1904

AVAILABLE DATA				
Corfinio-Roccacasale, Valle Peligna	250	Abr	AQ	BO
Lago Castel S. Vincenzo	700	Mol	IS	PF
Molina Aterno		Abr	AQ	BO
Popoli, Valle Peligna	250	Abr	AQ	BO

GENERAL DISTRIBUTION. Eastern-Mediterranean species, distributed in Balkanic peninsula (Croatia, Montenegro, Macedonia, Epirus, Peloponnesus) and widely distributed in Italy, from Veneto region to Sicily, more frequently in Central-Southern regions (Galvagni, 1973; Vigna Taglianti, 1968, 1994). In Abruzzo region it is known from few localities along the Adriatic coast in Teramo and Chieti provinces (Galvagni, 1973), in the Valle Peligna and Valle del Morrone, and recently it has been collected in the PNALM, in Molise region.

ECOLOGY AND REMARKS. Xerotermophilous species.

Forficula pubescens Gené, 1832

AVAILABLE DATA				
Lago di Barrea	990	Abr	AQ	PF
Popoli, Valle Peligna		Abr	AQ	LaGral97

GENERAL DISTRIBUTION. Western-Mediterranean species, described from Sardinia and widely distributed in Italy, Sardinia and Sicily, more frequent in tyrrhenian regions.

ECOLOGY AND REMARKS. Xerotermophilous Mediterranean species; observing the drawings of the paper by Schmidt & Herrmann (2000), the record from Sardinia of *Forficula lesnei* Finot, 1887, has most probably to be referred to *F. pubescens*. *F. lesnei* should be a W European species, with mainly Atlantic distribution, occurring only in Iberian peninsula, W France and England.

Forficula silana Costa, 1881

AVAILABLE DATA				
Civitella Alfedena	1120	Abr	AQ	PF

GENERAL DISTRIBUTION. S Apennine and Sicilian endemic taxon, distributed from Abruzzo (PNALM) and Molise (Monte Pagano and Matese Mts) regions in the N to the Nebrodi Mts (Monte Soro) in Sicily.

ECOLOGY AND REMARKS. *F. silana* is a characteristic species of termophilous beech woods in S Italy.

FAUNISTIC AND ECOLOGICAL COMMENTS

ENDEMIC SPECIES. Some taxa of the genus *Italopodisma* (*I. acuminata acuminata*, *I. a. marsicana*, *I. trapezoidalis trapezoidalis* and *I. t. aprutiana*) are endemic to the main mountains of the Park. *Decticus aprutianus*, described on the basis of material from mountains above Scanno (one of the municipalities of the Park), was previously considered occurring in most of the central Apennines; recent researches on bioacoustics of *Decticus* species of the Apennines, carried out by the University of Padua, showed that *D. aprutianus* lives actually on the Abruzzo, Lazio and Molise National Park mountains, while other short winged populations have to be considered different taxa. Only a very isolated population, living on the Pollino Mts (S Italy), seems to be very closely related to *D. aprutianus*, but shows different song pattern. A research on the identity of the population of *Chorthippus bruttius* living in Sangro Valley, on the centre area of the Park, both on the basis of morphological characters and bioacoustics, is still in progress. Also the identity of the species of the genus *Italohippus* living on the Park mountains is not clear and should deserve much attention.

OROPHILOUS SPECIES. Several species are confined on the top of the mountains, on dry and sunny slopes, covered by the snow for a long period of the year. The most orophilous species are *Barbitistes alpinus*, *Decticus aprutianus*, *Decticus verrucivorus verrucivorus*, *Bicolorana bicolor bicolor*, *Ephippiger ruffoi*, *Italopodisma* spp., *Aeropus sibiricus sibiricus*, *Stenobothrus apenninus*, *Stauroderus scalaris scalaris* and *Italohippus monticola*.

MESOPHILOUS SPECIES. Most of the species living in the Park have to be considered mesophilous. They live on a large range of habitats from high mountains to wet and xerophilous places, e. g.: *Poecilimon superbus*, *Tettigonia viridissima*, *Platycleis grisea grisea*, *Oedipoda germanica*, *Omocestus rufipes*, *Dirshius haemorroidalis*, *Gomphocerus rufus*, *Chorthippus dorsatus dorsatus*, *Glyptobothrus brunneus brunneus*, *Pseudochelidura orsinii*, *Forficula auricularia* and *Forficula silana*.

TERMOPHILOUS SPECIES. Some species are clearly termophilous and live only in the most xerophilous habitats. *Phyllodromica marginata* is a common species in hot and dry habitats of the Italian peninsula and its occurrence in the mountains is rare or occasional. Two species of Phasmatodea live in the Park, one parthenogenetic (*Clonopsis gallica*) and

one anphigonic (*Bacillus rossius rossius*). Mantodea, of which only one species (*Mantis religiosa*) lives in the area here considered, are termophilous. The most termophilous Orthoptera species are: *Tylopsis liliifolia*, *Decticus albifrons*, *Tessellana tessellata*, *Sepiana sepium*, *Rhacocleis germanica*, *Saga pedo*, *Oecanthus pellucens pellucens*, *Mogoplistes brunneus*, *Calliptamus* spp., *Dirshius petraeus*, *Glyptobothrus vagans vagans* and *Euchorthippus declivus*. Finally, among Dermaptera, *Euborellia moesta* is a termophilous species living at lower altitudes and in the surrounding territories of the Park.

HYGROPHILOUS SPECIES. Inside the Park there are many wet places, from the bottom of the valleys to the high mountains. Several species of Orthopteroid insects are exclusive of them: *Xiphidion discolor discolor*, *Pteronemobius concolor*, *Paratettix meridionalis*, *Uvarovitettix depressa*, *Tetrix subulata*, *Aiolopus thalassinum*, *Paracinema tricolor bisignata* and *Chorthippus bruttius*.

TROGLOPHILOUS AND ANTROPOPHILOUS SPECIES. Tipical cave dwelling species is the Orthoptera *Dolichopoda geniculata*. This species finds idoneous habitat in the litter of the woods and even, during the summer, in the cellars.

ENDANGERED SPECIES. The Orthopteroid insect fauna of the Abruzzo, Lazio and Molise National Park is characterised by the presence of little and isolated populations of rare or interesting species. Endemic species, as well as wet-places species, seem to be more endangered and their conservation need direct protection. The influence of grazing (with an increasing number of cows) is very important too, both on vegetation and on the water sources management. The Centro Studi Ecologici Appenninici of the Abruzzo, Lazio and Molise National Park is working to update the checklist of all the fauna of the Park, to evaluate the Biodiversity and identify the most endangered species. On the basis of several researches the Centro Studi had started a new project about the wet habitats of the Park, using as bioindicators Orthopteroid insects too.

ORIGIN OF THE ORTHOPTEROID FAUNA OF THE ABRUZZO, LAZIO AND MOLISE NATIONAL PARK

During the glacial ages, glaciers cyclically covered much of this area. The alternate increasing and dissolution of glaciers, originated some peculiar mountain fauna, derived from Northern species. The species of the genus *Italopodisma*, *Italohippus* and *Chorthippus bruttius* have clearly quaternary origin. These species are typically mountain or wetland elements, isolated after glacier retirement. Consequently, many Apennine species are endemic to a single mountain or chain. During the glacial ages too, the lower level of the sea, permitted the migration of several Balkanic species (transadriatic species) toward the Italian peninsula; *Barbitistes yersini* and *Forficula obtusangula* are typical transadriatic species. Another interesting aspect is the presence of xerothermic areas on high altitude. In these habitats, termophilous species live not far from orophilous ones. Many termophilous species clearly seem to have climbed up again the valleys that extend from the coast to the centre of the Apennines. *Bacillus rossius* and *Clonopsis gallica* (Phasmatodea), *Phyllodromica marginata* (Blattaria), many Orthoptera (e. g.: *Tylopsis liliifolia*, *Decticus albifrons*, *Rhacocleis germanica*, *Saga pedo*, *Gryllus bimaculatus*, *Calliptamus barbarus*), *Euborellia moesta*, *Forficula*

decipiens and *F. pubescens* (Dermaptera) are termophilous species commonly present along the Apennine valleys. The combination of all these aspects, makes the fauna and flora of Central Apennines very rich and peculiar.

CONCLUSIONS

The Orthopteroid fauna of the Abruzzo, Lazio and Molise National Park is very rich in species and particularly important from the ecological and biogeographical point of view. The area of the Park hosts some elements typical of S Italy (e.g. *Ephippiger cavannai*, *Chorthippus bruttius* and *Forficula silana*), others typical of the Abruzzo Apennines (e.g. *Ephippiger ruffoi*, *Decticus aprutianus*, *Italopodisma* spp. and *Italohippus* sp.) and some boreo-alpine species (*Aeropus sibiricus sibiricus* and *Stauroderus scalaris scalaris*). Some problems arise from the anthropic impact in the Park, particularly the management of pastures and the maintenance of wet areas.

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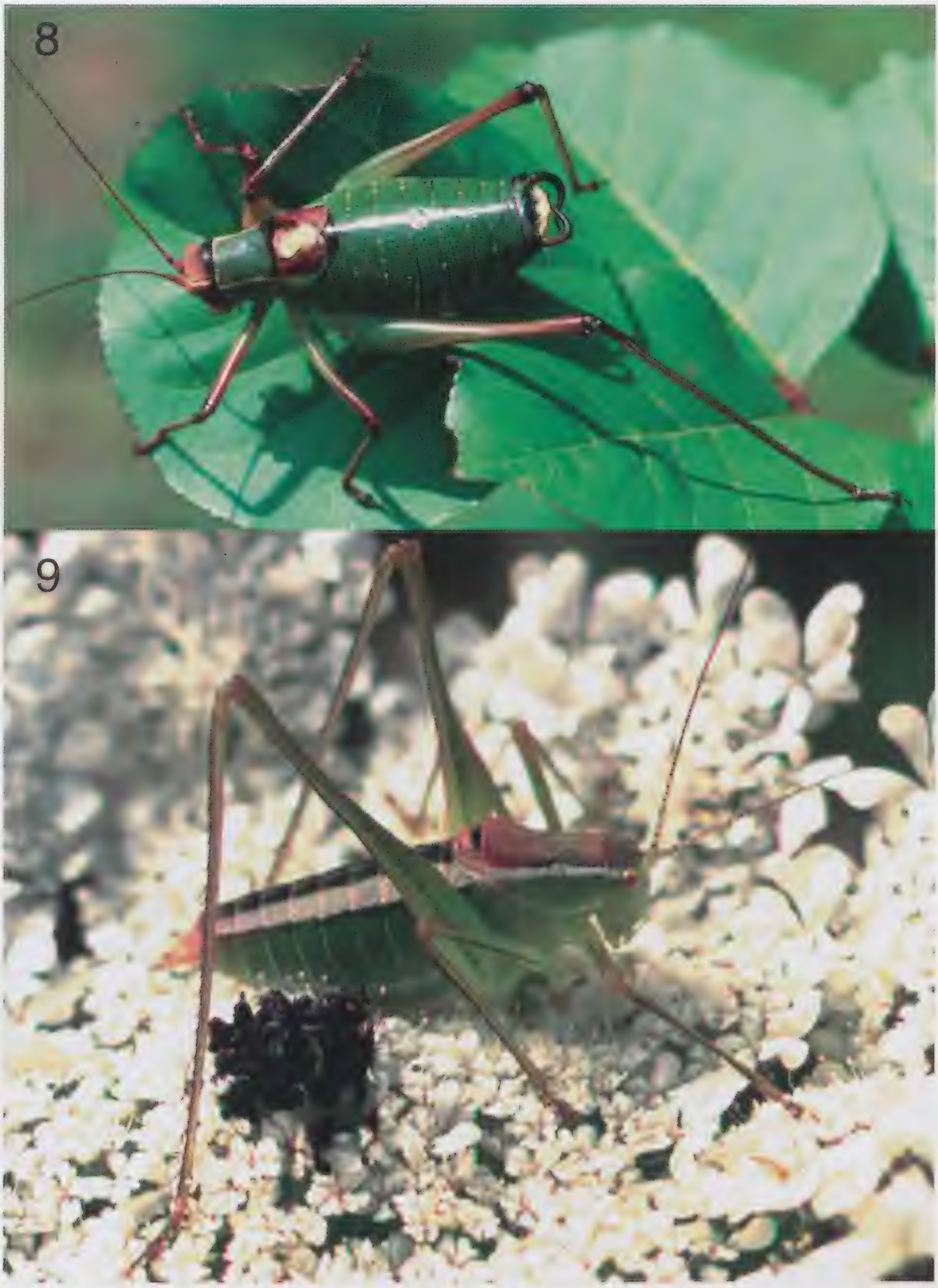
Figs 2-3. 2 - Fiume Sangro valley: thermophilous slopes and wet habitats, (Photo by P. Curti); 3 - thermophilous bushy habitat at Valle Pagana, Monte Meta, (Photo by P. Tollis).

Figs 4-5. 4 - Subalpine pastures at Le Mainarde; 5 - Lago di Montagna Spaccata, 1050 m, (Photos by P. Curti).

Figs 6-7. 6 - Alpine habitat at Monte Greco, Toppe del Tesoro, 2100 m, (Photo by P. Fontana); 7 - xerophilous stony alpine habitat at Monte Tartaro, (Photo by P. Tollis).



Figs 8-9. 8 - *Barbitistes yersini*, male, Sperone; 9 - *Poecilimon superbus*, male, Passo Godi; (Photos by P. Fontana).

Figs 10-11. 10 - *Decticus aprutianus*, male, Passo Godi; 11 - *Ephippiger cavannai*, male, Colle della Croce; (Photos by P. Fontana).

Figs 12-13. 12 - *Italopodisma trapezoidalis trapezoidalis*, female, Lago Vivo; 13 - *Italopodisma trapezoidalis aprutiana*, mating male and female, Rif. Pesco di Iorio; (Photos by P. Fontana).

Figs 14-15. 14 - *Chorthippus bruttius*, male, Pescasseroli, S.S. Marsicana Km 46; 15 - *Italohippus monticola*, male, Monte Rotondo; (Photos by P. Fontana).

Figs 16-17. 16 - *Glyptobothrus rubratibialis*, male, Monte delle Vitelle; 17 - *Clonopsis gallica*, female, Colle della Croce E, Alfedena; (Photos by P. Fontana).

Figs 18-19. 18 - *Pseudochelidura orsinii*, male, Rif. Pesco di Iorio; 19 - *Forficula silana*, male, Civitella Alfedena; (Photos by P. Fontana).

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El comportamiento en cautividad de *Calliptamus barbarus* (Orthoptera Acrididae)

Resumen - Se presentan los resultados del estudio de las relaciones inter e intrasexuales de *Calliptamus barbarus* Costa, 1836 en cautividad. Se establecen 11 unidades de comportamiento comunes para ambos sexos y una exclusiva de los machos. Por medio de diagramas cinemáticos se describen las interacciones observadas. Las relaciones intrasexuales apuntan en el sentido de un comportamiento territorial o, al menos, de distancia entre los individuos. En las relaciones intersexuales se establecen los comportamientos precópula de persecución activa y satélite, desarrollados por los machos, no habiéndose observado cooperación por parte de la hembra.

Abstract - *Behaviour in captivity of* Calliptamus barbarus *(Orthoptera Acrididae).*
The results of the study in captivity of intersexual and intrasexual relationship of *Calliptamus barbarus* Costa, 1836 are presented. Behavioural units for both sexes, male and female, were established. The observed interactions are described by means of cinematics diagrams. The intrasexual relationships point a certain territoriality or, at least, a keeping the distance behaviour between specimens. Two different behaviours, active and pursuit and "satellite", both developed by males in order to mate, are established. No female's co-operation all along the permating behaviour were observed.

Riassunto - *Comportamento in cattività di* Calliptamus barbarus *(Orthoptera Acrididae).*
Si presentano i risultati dello studio delle relazioni inter ed intrasessuali di *Calliptamus barbarus* Costa, 1836 in cattività. Vengono stabilite 11 unità di comportamento comuni per entrambi i sessi ed una esclusiva del maschio. Attraverso dei diagrammi cinematici vengono descritte le interazioni osservate. Le relazioni intrasessuali evidenziano un certo comportamento territoriale o, almeno, di distanza tra gli individui. Nelle relazioni intersessuali si stabiliscono i comportamenti precopulativi di persecuzione attiva e satellite, sviluppati dai maschi; non sono state osservate collaborazioni da parte della femmina.

Key words: Orthopera, *Calliptamus barbarus*, behaviour, intra and intersexual relationships.

INTRODUCCIÓN

Calliptamus barbarus Costa, 1836 (Orthoptera: Acrididae: Catantopinae) se encuentra ampliamente distribuida por toda la zona meridional paleártica. Los datos existentes sobre el comportamiento de Catantopinos y del género *Calliptamus,* en particular, son escasos. En la bibliografía consultada únicamente hemos encontrado las referencias que hace Faber (1953) sobre *Calliptamus italicus* (Linneo, 1758), en las que pone de manifiesto la existencia de producción de sonido mediante fricción mandibular como canto ordinario, durante el cortejo y como expresión de molestia. Estos sonidos pueden ir acompañados de movimientos convulsivos de los fémures posteriores. Uvarov (1977) indica que el macho del género para abordar a la hembra, se mueve alrededor de ella emitiendo cortos cantos con las mandíbulas y realizando movimientos con los fémures posteriores cuyo significado no está claro.

No existiendo datos sobre ninguna otra especie y siguiendo con la línea de investigación del conocimiento del comportamiento de los ortópteros ibéricos, consideramos interesante estudiar el comportamiento de *C. barbarus*.

MATERIAL Y MÉTODOS

El estudio se desarrolló con los siguientes ejemplares:

7 ♂♂ y 5 ♀♀ 27/07/1999. Sierra Espuña 1130 m. (Mu).

10 ♂♂ y 6 ♀♀ 9/09/1999. Sierra Espuña 1130 m. (Mu).

Una vez capturados se trasladaban vivos al laboratorio donde se separaban según el sexo. Se mantenían en insectarios de madera de dimensiones 40 x 34 X 40 cm, con la parte anterior de cristal y el techo o parte superior de una rejilla metálica para la ventilación. La fuente de luz y calor era una bombilla incandescente de 25 watios, que se mantenía encendida durante 12 horas diarias. Se les proporcionaba alimento diverso y agua diariamente.

Las experiencias se desarrollaron entre 27 julio y el 15 de octubre de 1999. En ellas los ejemplares, debidamente identificados mediante una mancha de esmalte en el pronoto, se situaban en un insectario de 32 x 42 x 32 cm, de características similares a los anteriores. Como fuente de luz y calor se utilizaban dos flexos situados en el techo, cada uno con una bombilla de 60 watios. La temperatura en el interior se mantenía estable entre 34-36 ºC.

Cada experiencia duraba aproximadamente 2 horas, durante las cuales se recogía la actividad desarrollada por los individuos con una cámara de vídeo, modelo JVC GR-ax70, al mismo tiempo que un observador tomaba nota de la actividad.

Se analizaron 27 experiencias entre machos, 34 entre hembras y 17 experiencias entre un macho y una hembra.

Todos los registros obtenidos fueron estudiados ralentizando la imagen 1/10 con un reproductor de vídeo JVC HR-S7851EU y un monitor SONY Kx-14CP1. En una primera visualización se registraba la actividad de un individuo. En una segunda se analizaba la del otro individuo en relación con el primero. Para el registro de esta doble actividad se creó una plantilla especial de registro.

El número de unidades establecidas inicialmente fue 13 pero, de acuerdo con Wood *et al.* (1980) se eliminaron aquellas unidades consideradas raras por presentar una frecuencia inferior al 5% respecto al resto de unidades en todas las experiencias realizadas, excepto la unidad salto que, aunque fue observada en pocas ocasiones, no fue suprimida por ser la culminación de un comportamiento. Con el mismo fin todas las unidades que implican la limpieza de alguna estructura se agruparon en una única unidad que se denominó Aseo.

Para comprobar que las unidades durante el desarrollo del comportamiento no eran realizadas al azar se calculó la aparición de cada unidad de comportamiento en las tres relaciones estudiadas y para cada sexo y se realizó una prueba X^2 con un nivel de significación del 95% y 7 grados de libertad.

Después se calculó con qué frecuencia, cuando un individuo realizaba una unidad de comportamiento dada, provocaba una respuesta en otro individuo, entendiendo co-

mo respuesta que el individuo realizara inmediatamente una unidad si estaba quieto o cambiara por otra la que en ese momento estaba realizando. Se representó gráficamente con un diagrama de cuadros (Morris, 1958 cf. Eibl-Eibl-Eibesfeldt, 1979) aquellas unidades que recibían una respuesta no azarosa lo que se comprobó mediante una prueba X^2. Al realizar este análisis se eliminó la unidad Aseo porque los comportamientos de limpieza, en principio, son realizados sin una motivación especial.

Para establecer las secuencias del comportamiento se realizaron tablas de doble entrada para cada encuentro entre dos individuos, posteriormente, se sumaban las tablas pertenecientes a los individuos del mismo sexo que habían sido sometidos a la misma experiencia.

Las transiciones fueron representadas gráficamente mediante diagramas cinemáticos, en los que se establece una relación entre el tamaño de los cuadros (machos) y los círculos (hembras) que representan las unidades de comportamiento y su frecuencia de aparición, así como entre el grosor de las flechas y la frecuencia de las transiciones. En estos diagramas únicamente fueron representadas las transiciones entre las unidades que aparecían en un mayor porcentaje que si ocurriera al azar; lo que se determinó con una prueba X^2 con un nivel de significación del 95% y 6 grados de libertad.

No se pueden analizar transiciones solamente contando el número de pasos de una unidad a otra, porque los datos no resultarían independientes. El número de pasos de una unidad a otra, por ejemplo de la unidad a → b, depende del número de sucesos de "a" así como del número de transiciones entre "a" y cualquier otra unidad de comportamiento. Para evitar este problema se trabajó con el número de transiciones pero calculando la frecuencia de cada transición como una probabilidad condicional, donde la probabilidad de que ocurra "b" teniendo en cuenta que "a" ya ha ocurrido, puede ser estimada dividiendo el número de transiciones a → b por el número de veces que la primera unidad de comportamiento precede a cualquier unidad (a → cualquier u.d.c.) (Leonard & Ringo, 1978)

Resultados y discusión

Las unidades de comportamiento establecidas fueron las siguientes:

1 - Movimiento convulsivo de fémures posteriores (MCP): Unidad formada por uno o varios movimientos rápidos y bruscos realizados con uno o ambos fémures posteriores.

El individuo separa ligeramente el o los fémures del abdomen a la vez que los eleva para bajarlos muy rápidamente, volviendo a la posición de reposo. La amplitud de la elevación es variable, pero no supera los 90º respecto a la horizontal. Cuando es realizado con ambos fémures el movimiento puede ser coordinado o no.

El movimiento puede ser tal que al bajar los fémures y chocar contra el sustrato produzcan sonido de golpeteo.

La unidad de comportamiento puede constar de un solo movimiento aislado o de varios consecutivos. Se ha llegado a observar hasta 27 veces en 17 segundos.

Suele ir acompañado de un movimiento rápido y brusco hacia los lados de cada una de las antenas y palpos, y de emisiones acústicas producidas por fricción mandi-

bular (Larrosa, 2002), aunque su frecuencia varía según el sexo.

Los individuos realizan esta unidad de comportamiento cuando se encuentran próximos a otro individuo, y es tanto más frecuente cuanto más próximos se encuentran.

2 - Movimiento alternativo de fémures posteriores (MAP): Unidad formada por uno o varios movimientos alternativos de los fémures posteriores.

Ambos fémures suben y bajan alternativamente, movimiento en tijera, de forma que cuando uno sube el otro baja. La altura que alcanzan es variable, siempre superando la rodilla del margen superior de las tegminas en reposo.

Se ha observado cuando un individuo pasa cerca de otro o cuando se aleja.

3 - Subir y bajar uno de los fémures posteriores (S1P): Unidad formada por uno o varios movimientos de subida y bajada de un fémur posterior mientras el otro queda en reposo. No hay extensión de la tibia.

La amplitud del movimiento es variable, pero siempre la rodilla supera el margen superior de las tegminas, y aunque hay excepciones, suele alcanzar los 90º respecto a la horizontal, en algunas ocasiones superándolo. Esto permite la visión de la cara interna del fémur.

La unidad es realizada en proximidad a otro individuo.

4 - Subir y bajar ambos fémures posteriores (S2P): Unidad formada por uno o varios movimientos de subida y bajada de ambos fémures posteriores al mismo tiempo.

La amplitud del movimiento es variable aunque ambos fémures suelen alcanzar los 90º respecto a la horizontal y en las hembras pueden llegar a alcanzar los 180º, quedando horizontales con la rodilla dirigida hacia la cabeza.

Durante el desarrollo del movimiento puede existir una ligera descoordinación entre los fémures pero esta falta de asimetría no deja al descubierto la cara interna de los mismos.

Aparece en las mismas situaciones que la unidad de comportamiento anterior.

5 - Patada tibia (PTI): Esta unidad de comportamiento incluye todos los movimientos en los que el animal eleva uno de los fémures posteriores y extiende la tibia, recogiéndola de inmediato.

Es muy variable en cuanto a la amplitud en que se eleva el fémur, que puede alcanzar hasta los 180º, aunque lo más usual es que el fémur alcance una posición de 90º respecto a la horizontal y que la tibia, una vez completamente extendida, alcance una posición perpendicular respecto al fémur elevado.

Los fémures pueden moverse de modo alternativo o ser un único fémur el que realice el movimiento. El número de elevaciones en ambos casos es variable. La tibia puede extenderse y recogerse una sola vez o varias cuando se detiene el fémur.

Se ha observado en situaciones en las que dos machos se encuentran muy próximos o incluso tocándose. En las hembras también se ha observado, tanto cuando se aproxima otra hembra como cuando rechaza a un macho.

También ha sido observada en varias ocasiones en machos situados delante de hembras, aunque en estos casos los machos extienden la tibia más lentamente y la mantienen extendida durante breves instantes.

6 - Avance (AV): Esta unidad de comportamiento incluye cualquier desplazamiento del individuo, tanto si es mediante un salto como caminando, tanto hacia delante como hacia atrás.

7 - Quietud (Q): El animal permanece inactivo durante 5 o más segundos.

8 - Chas (CH): Despliegue de las tegminas y las alas de forma muy rápida.

El animal abre y eleva horizontal y verticalmente las alas y las tegminas y las vuelve a plegar. El movimiento es muy rápido y se percibe como un destello rojo debido a la coloración de las alas. Se produce esporádicamente en ambos sexos.

9 - Pataleo con las patas delanteras y medias (PPD): El animal golpea el sustrato con los tarsos de las patas delanteras y medias derechas o izquierdas, nunca de forma cruzada.

Esta unidad ha sido observada en ambos sexos pero con muy baja frecuencia y en situaciones diversas.

10 - Salto (SAL): Esta unidad de comportamiento sólo aparece en machos. Cuando el animal trata de copular con la hembra se coloca detrás de ella y curva lateralmente el abdomen situándolo con el extremo dirigido a la cabeza. En esta posición salta sobre la hembra y la sujeta con los cercos por la parte final del abdomen.

Las unidades de comportamiento de limpieza: aseo de ojos, aseo de antenas y aseo de fémures posteriores se englobaron en una única unidad que denominamos Aseo (AS).

Las unidades Pataleo con patas delanteras y medias y Chas, por su baja frecuencia, no se tuvieron en cuenta a la hora de realizar los análisis.

INTERACCIONES ENTRE MACHOS. El número de veces que ha sido observada cada unidad de comportamiento aparece reflejado en la tabla 1. El resultado de la prueba estadística muestra que estas unidades no aparecen al azar ($X^2 > X^2_{(0,05,7)}$).

Como se puede observar en la tabla 1 la unidad que desencadena con un mayor porcentaje una respuesta es MCP. En la tabla 2 observamos que la respuesta que aparece también con mayor frecuencia para todas las unidades de comportamiento, excepto para quietud (Q), es movimiento convulsivo de fémures posteriores (MCP). Esta unidad fue la más frecuente durante la interacción (tabla 1).

En el diagrama cinemático de la interacción entre machos (fig. 1) se puede observar que si un individuo se encuentra quieto (Q) y se le acerca otro individuo comenzará a realizar movimientos subiendo y bajando un fémur posterior (S1P), intercalándolos con movimientos con ambos fémures (S2P). Esto podría ser un aviso del rechazo hacia el individuo que se aproxima.

Conforme se aproxima comenzará a realizar movimientos rápidos y bruscos con los fémures posteriores (MCP) que acompañará de emisiones acústicas y serán tanto más rápidos cuanto más cerca se encuentre el otro individuo. Si el otro individuo se queda quieto, desde la unidad subir y bajar un fémur posterior (S1P) puede volver a realizar las unidades anteriores e incluso con menor frecuencia patada tibia (PTI).

Estas interacciones se han observado cuando un individuo se aproxima a otro y, aunque no se han obtenido medidas exactas de la distancia que mantenían los indivi-

duos durante el desarrollo de todo el comportamiento, por las observaciones podemos estimar que comienza a desencadenarse cuando la distancia entre ellos es menor de 2-4 centímetros. No obstante hay casos en que esto ocurre y se puede superar esta distancia, pero en el momento en el que uno de los individuos inicia los movimientos con sus fémures posteriores provoca la interacción entre ambos.

Estos resultados y las observaciones realizadas apuntan que se trate de un comportamiento agonístico, en el que los individuos se enfrentan para mantener un territorio o un espacio individual.

Cabe suponer que la unidad movimiento convulsivo de fémures posteriores (MCP), tanto por la rapidez del movimiento como por las emisiones acústicas que la acompañan, provoca un efecto visual y sonoro que advierte de la presencia del individuo. Desencadena en el otro individuo tanto la producción de sonido, acompañando al movimiento convulsivo, como otros movimientos de fémures posteriores. Por tanto, entre los individuos se establece comunicación acústica y visual.

Respecto a la comunicación visual suponemos que la coloración conspicua de la cara interna de los fémures de *C. barbarus* puede ser un mecanismo que la facilite.

INTERACCIONES ENTRE HEMBRAS. En la tabla 3 se recoge el número de ocasiones en las que se ha observado cada unidad de comportamiento. El resultado de la prueba estadística muestra que estas unidades no aparecen al azar ($X^2 > X^2_{(0,05,7)}$).

En la tabla 3 observamos que la unidad que desencadena una mayor respuesta es MCP, sin embargo esta unidad es poco frecuente y desencadena como respuesta una unidad al azar ($X^2 < X^2_{(0,05,6)}$). La única unidad que recibe una respuesta no azarosa es S1P (tabla 4) que desencadena con mayor porcentaje S2P que es la unidad más frecuente durante las interacciones.

En el diagrama cinemático representando las transiciones no azarosas entre unidades de comportamiento (fig. 2) podemos observar que si una hembra se encuentra quieta (Q) y comienza a interaccionar con otra iniciará movimientos de subir y bajar ambos fémures posteriores (S2P), caminará (AV) y volverá a realizarlos (S2P), intercalándolos con movimientos de subir y bajar un solo fémur posterior (S1P) y movimientos alternativos de fémures (MAP).

Teniendo en cuenta que los encuentros entre las hembras son casuales, pues no se ha observado una búsqueda activa como la observada en los machos, la interacción más frecuente entre dos hembras es que levanten ambos fémures posteriores (S2P) o un único fémur (S1P), o que realicen ambas uno de estos dos movimientos al pasar una cerca de otra.

Por lo tanto, los movimientos de subir y bajar uno o ambos fémures pueden considerarse como una advertencia de la presencia del individuo.

La producción de sonido en las hembras es menos frecuente que en los machos. La unidad movimiento convulsivo de fémures posteriores, que es la única acompañada de emisiones acústicas, es la unidad menos frecuente durante las interacciones entre hembras, al contrario de lo que ocurre en las interacciones entre machos.

Las interacciones entre las hembras son más breves que entre los machos, siem-

pre se alejan más rápidamente y realizan un menor número de unidades durante la interacción. El número de experiencias analizadas en las que interaccionaron dos hembras (34) fue superior al número de interacciones entre machos (17), sin embargo el número total de unidades realizadas en el caso de las hembra fue inferior (tablas 1 y 3)

Ante estos resultados suponemos que las hembras son menos agresivas ante la presencia de un individuo de su mismo sexo que los machos.

Interacciones entre machos y hembras

La aparición de las distintas unidades de comportamiento durante la interacción entre machos y hembras entre sí (tabla 5) no fue al azar ($X^2 > X^2_{(0,05,7)}$).

Las unidades que al ser realizadas por un macho provocan una mayor respuesta en la hembra son patada tibia (PTI) y avanzar (AV) (tabla 5). De estas dos unidades avanzar provoca en la hembra respuestas no azarosas (tabla 6). Cuando el macho avanza (AV), la hembra, la mayoría de veces, avanza (AV) alejándose de él o, con menor frecuencia, levanta ambos fémures posteriores (S2P).

La hembra reacciona, sobre todo, ante el acercamiento del macho y ante las señales visuales que el macho realiza con los fémures posteriores, y lo hace alejándose de él o con movimientos que, posiblemente, le adviertan de su presencia.

La unidad que al ser realizada por una hembra provoca una mayor respuesta en el macho es avanzar (AV) (tabla 5). Si la hembra avanza (AV), alejándose del macho, lo más probable es que él la siga (AV); con una frecuencia menor realiza movimientos con uno o ambos fémures posteriores (S1p,S2P) o movimientos convulsivos (MCP) (tabla 7). En este caso también la unidad Patada tibia (PTI) al ser realizada por una hembra provoca un alto porcentaje de respuesta azarosa.

La unidad salto no aparece reflejada en el análisis por ser considerada la culminación de la interacción entre la hembra y el macho.

En el diagrama cinemático en el que aparecen las transiciones entre unidades que realizan los machos cuando se encuentran con hembras (fig. 3) podemos ver que las transiciones que ocurren desde un estado de quietud del individuo (Q) son hacia la unidad de comportamiento avanzar (AV) y desde ésta nuevamente a quietud.

Un macho, cuando detecta a una hembra, trata de situarse tras ella. Adopta una posición en la que mantiene las antenas horizontales o dirigidas hacia el suleo y los fémures posteriores los sitúa por debajo del borde dorsal de las tegminas. En esta posición permanece quieto (Q), siempre orientado hacia la hembra.

Si la hembra permanece quieta, el macho comenzará a avanzar (AV) un poco, volverá a estar quieto (Q) y nuevamente avanzará (AV) para volver a quedarse quieto y así se irá aproximando a ella. Si la hembra avanza, él procurará avanzar detrás de ella. A esta secuencia de unidades la hemos denominado Persecución Activa de la hembra, y es similar a la que describe Faber (1953) para *Calliptamus italicus*, sin darle nombre.

En algunas ocasiones parece que la hembra descubriera al macho porque se gira, situándose de frente a él, y comienza a realizar movimientos con los fémures posteriores; es entonces cuando los machos realizan también movimientos con los fémures: subir y bajar un fémur posterior (S1P), patada tibia (PTI), subir y bajar ambos fémures (S2P) y movimiento alternativo de fémures (MAP). Si la hembra se detiene, el macho se de-

tiene pero si continúa realizando movimientos con los fémures posteriores (MCP), acompañados de emisiones acústicas. Esta secuencia que realiza el macho cuando la hembra se sitúa frente a él la hemos denominado comportamiento Satélite.

El macho trata de volver a situarse detrás de la hembra con el fin de poder saltarle encima. En la figura 3 la flecha discontinua representa esta vuelta al comportamiento Persecución Activa después de realizar el comportamiento Satélite.

Se ha observado que al salto (SAL) que da el individuo, para atrapar a la hembra, lo puede hacer mientras avanza hacia ella; otras veces està breves instantes quieto.

En el diagrama cinemático (fig. 4) que presenta las transiciones entre unidades en el comportamiento de las hembras se observa que también existen transiciones entre quietud (Q) y avanzar (AV). Cuando el macho se está acercando a la hembra ellas se aleja de él (AV), o bien o permanece quieta (Q), o puede realizar movimientos de subir y bajar ambos fémures posteriores (S2P). De las observaciones realizadas se deduce que la unidad que realiza la hembra depende de la rapidez con la que se acerca el macho; si el macho se acerca rápido la hembra la mayoría de veces opta por huir de él (AV), si se acerca lentamente o permanece quieta o sube y baja los fémures posteriores (S2P).

Si el macho se acerca mucho, la hembra se gira hacia él de forma que quedan enfrentados y comienza a realizar movimientos de subir y bajar ambos fémures posteriores, movimientos convulsivos de fémures, movimientos alternativos con los mismos y movimientos de subir y bajar un solo fémur. Este hecho, que impide el salto de los machos, parece que es lo que provoca que éstos desarrollen el comportamiento Satélite.

La reacción que provocó en la hembra el salto del macho, en las tres ocasiones en las que se observó (tabla 5), fue la misma: la hembra trató de librarse del macho realizando movimientos con los fémures posteriores y dando patadas con las tibias. De las tres ocasiones, en una el macho logró quedar encima de la hembra, en las otras dos el macho salió despedido al recibir una patada.

En ningún momento parece haber consentimiento de la hembra al acercamiento del macho, siempre se aleja de él o realiza movimientos de patas posteriores, no habiéndose detectado aproximación por parte de ella.

RESUMEN Y CONCLUSIONES

El estudio del comportamiento de los machos durante las interacciones con individuos de su mismo sexo muestra que son individuos territoriales que rechazan la cercanía de otro macho. La unidad que realizan con más frecuencia y que parece tener un carácter intimidatorio es movimiento convulsivo de los fémures posteriores acompañada de emisiones acústicas.

Cuando los machos se encuentran con hembras la secuencia de comportamiento que desarrollan es distinta. Adoptan una posición con las antenas dirigidas hacia el sustrato y las rodillas posteriores por debajo del margen superior de las tegminas e intentan acercarse por detrás de las hembras.

Durante este comportamiento las unidades más frecuentes son avanzar y quietud,

puesto que el macho avanza lentamente hacia la hembra, permanece quieto y vuelve a avanzar. Si logran acercarse a la hembra, alrededor de 2 cm, curvan la parte final de su abdomen y lo aproximan al de ella, es entonces cuando saltan sobre la hembra y la intentan agarrar con los cercos para conseguir la cópula. A esta secuencia de comportamiento la hemos denominado Persecución Activa de la hembra.

Cuando la hembra sorprende al macho y se gira hacia él realizando movimientos con los fémures posteriores, él desarrolla otra pauta de comportamiento, comenzando a realizar movimientos convulsivos con los fémures. A esta secuencia de comportamiento la hemos denominado Satélite. El macho siempre intenta volver a situarse detrás de la hembra y realizar nuevamente la secuencia de Persecución Activa de la hembra.

Las hembras en sus relaciones intersexuales parecen ser menos agresivas que los machos, posiblemente sean menos territoriales. La interacción más frecuente es que pasen cerca una de otra, alrededor 3-4 cm, y una de ellas, o ambas, suban y bajen uno o ambos fémures posteriores. Si el acercamiento es mayor realizan otros movimientos con los fémures posteriores.

Cuando se encuentran con machos, si detectan que uno se empieza a aproximar, se alejan de él al mismo tiempo pueden subir y bajar ambos fémures posteriores. Cuando el macho la persigue la hembra siempre huye de él, no existe aproximación por parte de ella hacia el macho.

Si la hembra se gira cuando el macho se encuentra alrededor de 2 cm de ella comienza a realizar movimientos con los fémures posteriores. Cuando el macho salta encima de la hembra, no se ha observado que la hembra permita la cópula sin resistencia en ninguna ocasión.

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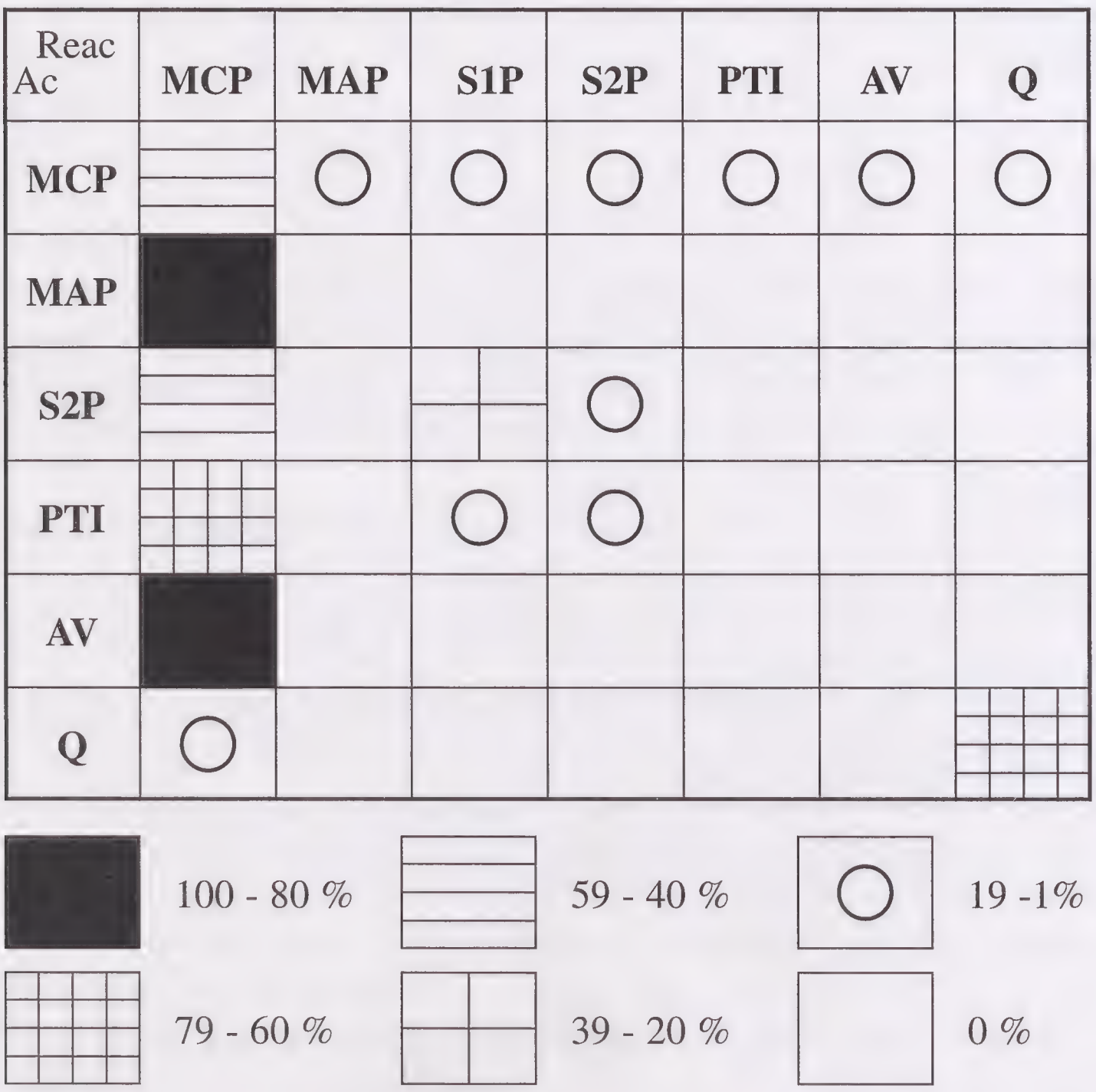
Tab. 1. Interacciones entre machos. **Aparición:** Número de observaciones de las distintas unidades de comportamiento (U.D.C.). **%Respuesta:** Respuesta que desencadena cada unidad expresada en porcentaje. **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
Tab. 1. Interactions between males. **Aparición:** Number of remarks of every behavioural units (U.D.C.). **% Respuesta:** Answer promoted by every behavioural unit expressed as percentage. **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude.

U.D.C.	MCP	MAP	S1P	S2P	PTI	AV	AS	Q	TOTAL
Aparición	70	20	53	46	20	32	14	44	299
%Respuesta	84,29	15	11,32	15,22	40	15,63	-	13,64	

Tab. 2. Diagrama de cuadros de las interacciones entre machos. **Ac:** unidades que al ser realizadas provocan una respuesta no azarosa (**Reac**). **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
Tab. 2. Answer diagram of interactions between males. **Ac:** Behavioural units which provoke a non random answer (**Reac**). **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude.



Tab. 3. Interacciones entre hembras. **Aparición**: Número de observaciones de las distintas unidades de comportamiento (U.D.C.). **%Respuesta**: Respuesta que desencadena cada unidad expresado en porcentaje. **MCP**: Movimiento convulsivo de fémures posteriores. **MAP**: Movimiento alternativo de fémures posteriores. **S1P**: Subir y bajar uno de los fémures posteriores. **S2P**: Subir y bajar ambos fémures posteriores. **PTI**: Patada tibia. **AV**: Avance. **AS**: Aseo. **Q**: Quietud.
Tab. 3. Interactions between females. **Aparición**: Number of remarks of every behavioural units (U.D.C.). **% Respuesta**: Answer promoted by every behavioural unit expressed as percentage. **MCP**: Quick and sudden movement of hind femora. **MAP**: Hind femora going up and down alternately. **S1P**: One of the hind femora goes up and down. **S2P**: Both hind femora going up and down at the same time. **PTI**: Kicking out with hind tibia. **AV**: Walking. **AS**: Cleaning. **Q**: Quietude.

U.D.C.	MCP	MAP	S1P	S2P	PTI	AV	AS	Q	TOTAL
Aparición	8	20	39	72	27	47	14	39	366
%Respuesta	62,5	5	20,51	19,44	37,04	29,79	-	0	

Tab. 4. Diagrama de cuadros de las interacciones entre hembras. **Ac:** unidades que al ser realizadas provocan una respuesta no azarosa (**Reac**). **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
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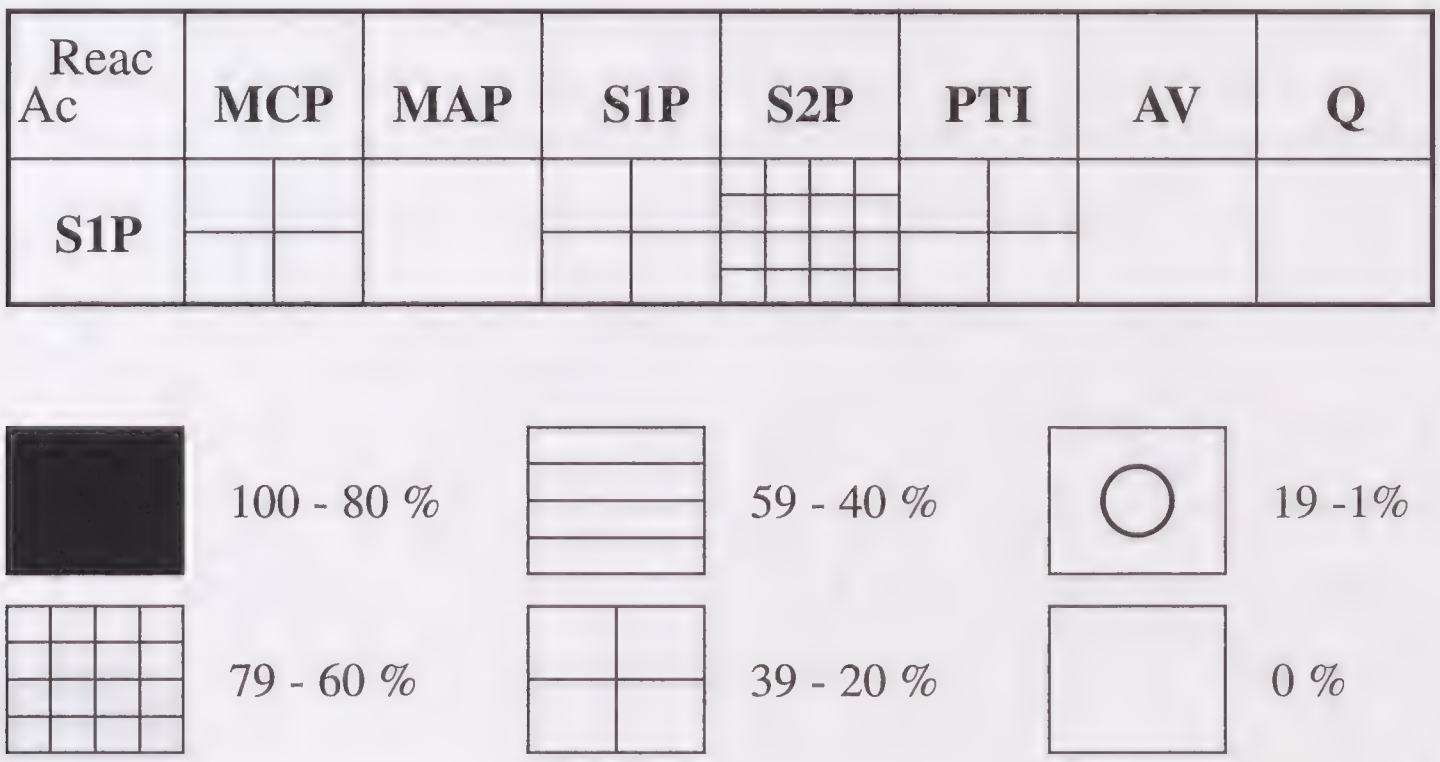
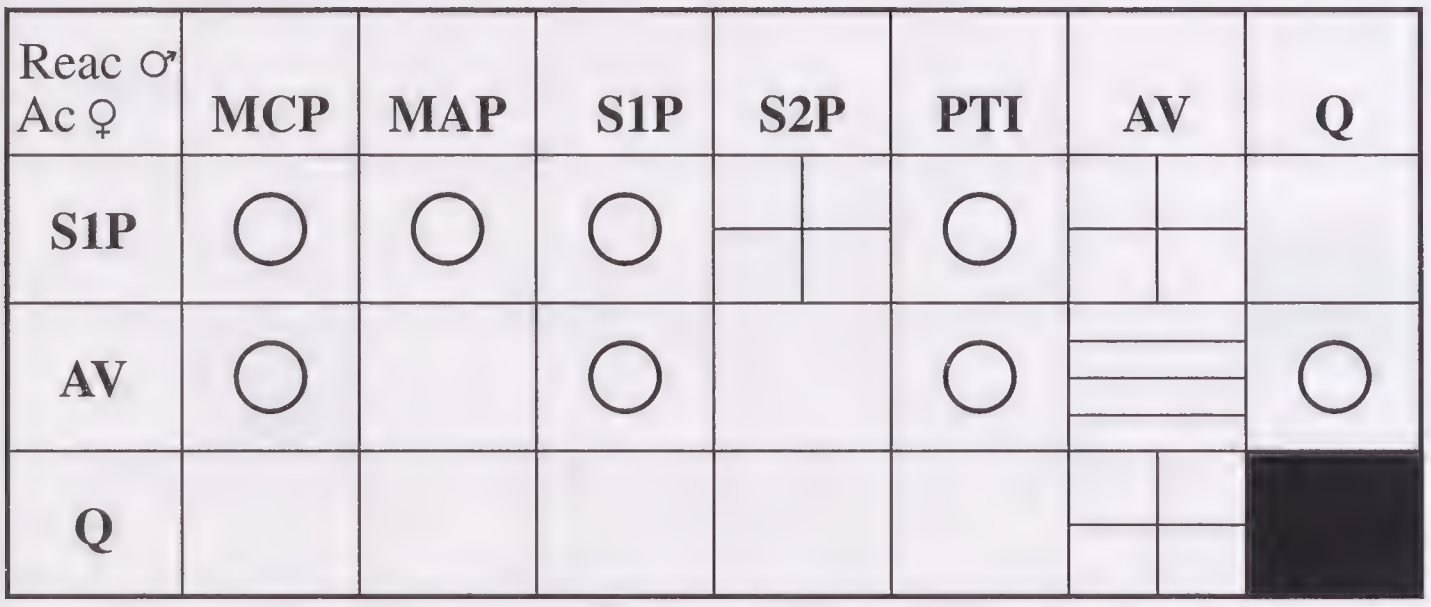


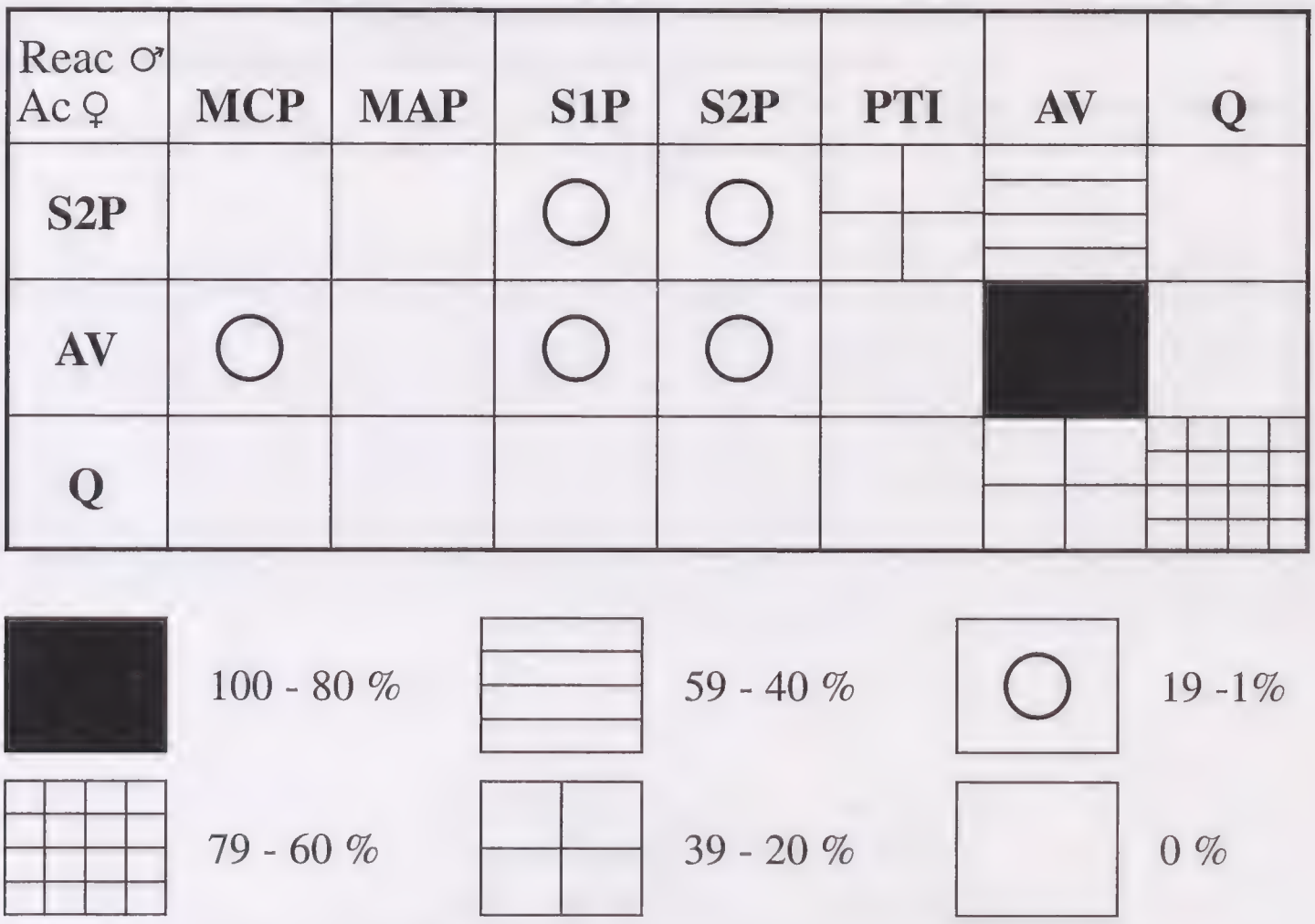
Tab. 5. Interacciones entre machos y hembras. **Aparición:** Número de observaciones de las distintas unidades de comportamiento (U.D.C.). **%Respuesta:** Respuesta que desencadena cada unidad expresado en porcentaje. **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud. **SAL:** Salto.
Tab. 5. Interactions between males and females. **Aparición:** Number of remarks of every behavioural units (U.D.C.). **% Respuesta:** Answer promoted by every behavioural unit expressed as percentage. **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude. **SAL:** Assault.

U.D.C.	**MCP**	**MAP**	**S1P**	**S2P**	**PTI**	**AV**	**AS**	**Q**	**TOTAL**	**SAL**
Machos										
Aparición	31	13	56	34	36	77	10	78	335	3
%Respuesta	12,9	23,08	33,93	23,53	52,78	48,05	-	12,82		
Hembras										
Aparición	47	24	37	87	15	83	17	59	369	
%Respuesta	27,66	20,83	18,92	31,03	46,67	65,06	-	28,01		

Tab. 6. Diagrama de cuadros de las interacciones entre machos y hembras. **Ac:** unidades que al ser realizadas por un macho provocan una respuesta no azarosa en una hembra (**Reac**). **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
Tab. 6. Answer diagram of interactions between males and females. **Ac:** Behavioural male units which provoke a non random answer in females (**Reac**). **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude.



Tab. 7. Diagrama de cuadros de las interacciones entre hembras y machos. **Ac:** unidades que al ser realizadas por una hembra provocan una respuesta no azarosa en un macho (**Reac**). **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
Tab. 7. Answer diagram of interactions between females and males. **Ac:** Behavioural female units which provoke a non random answer in males (**Reac**). **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude.



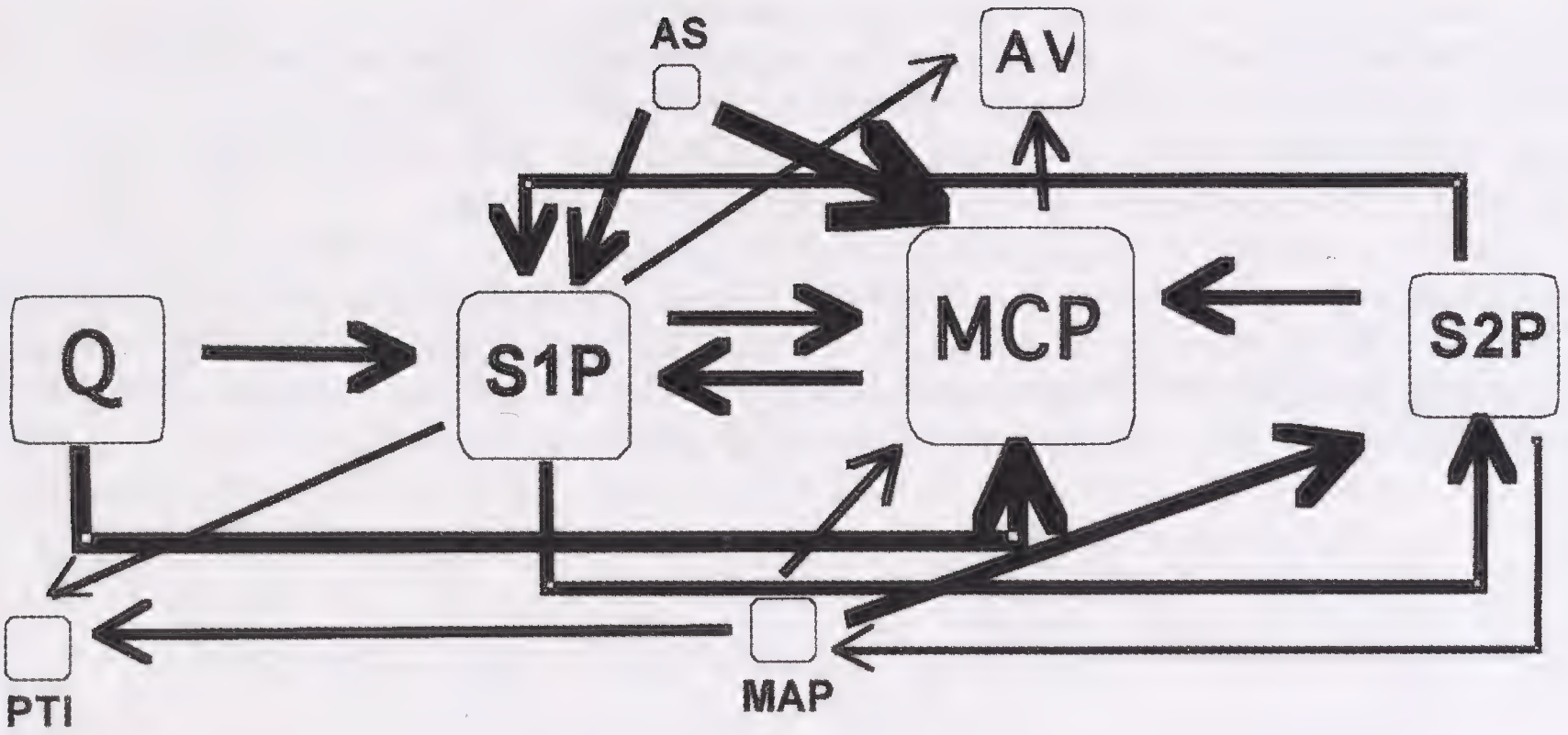


Fig. 1. Diagrama cinemático de las interacciones entre machos. **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud.
Fig. 1. Cinematic diagram of interactions between males. **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude.

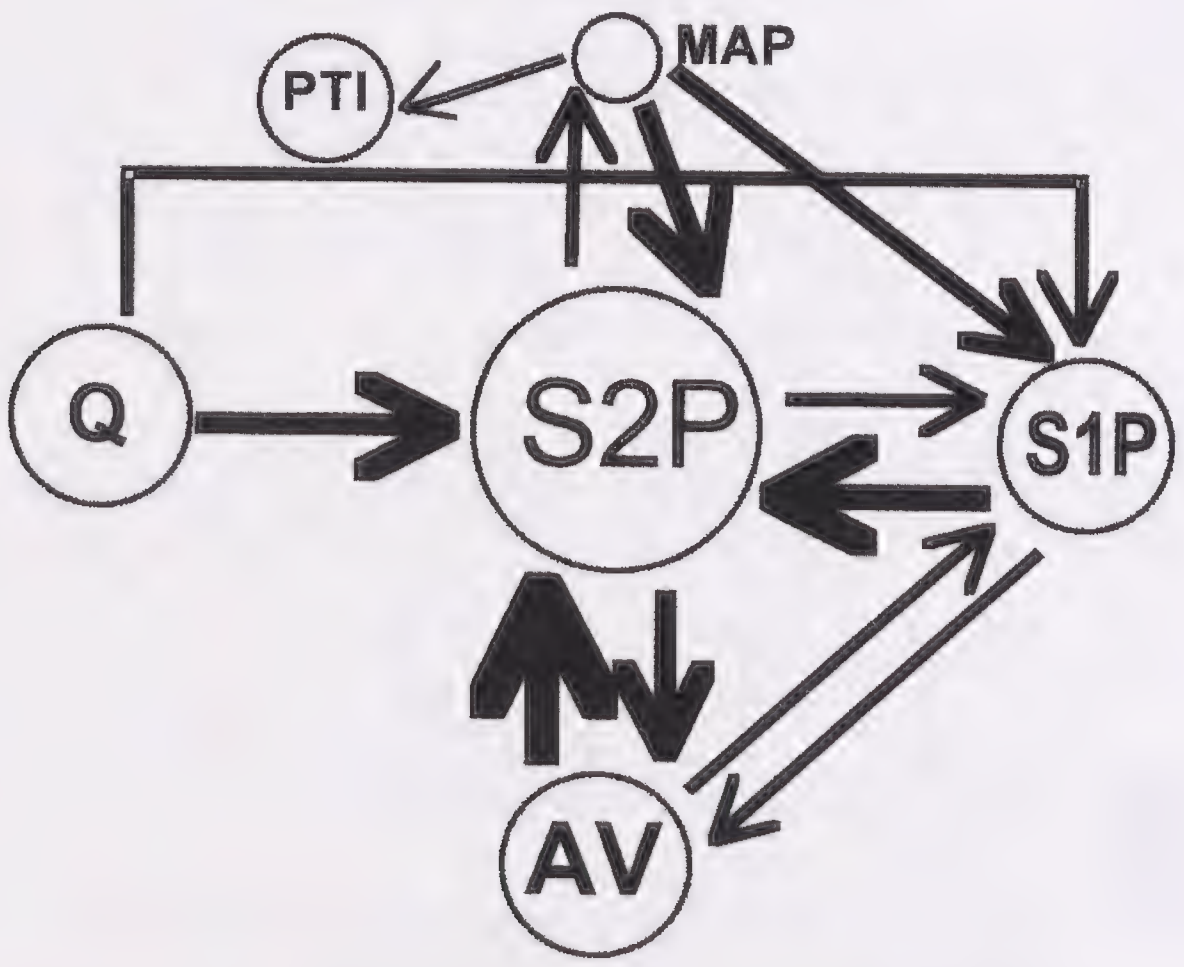


Fig. 2. Diagrama cinemático de las interacciones entre hembras. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **Q:** Quietud.
Fig. 2. Cinematic diagram of interactions between females. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **Q:** Quietude.

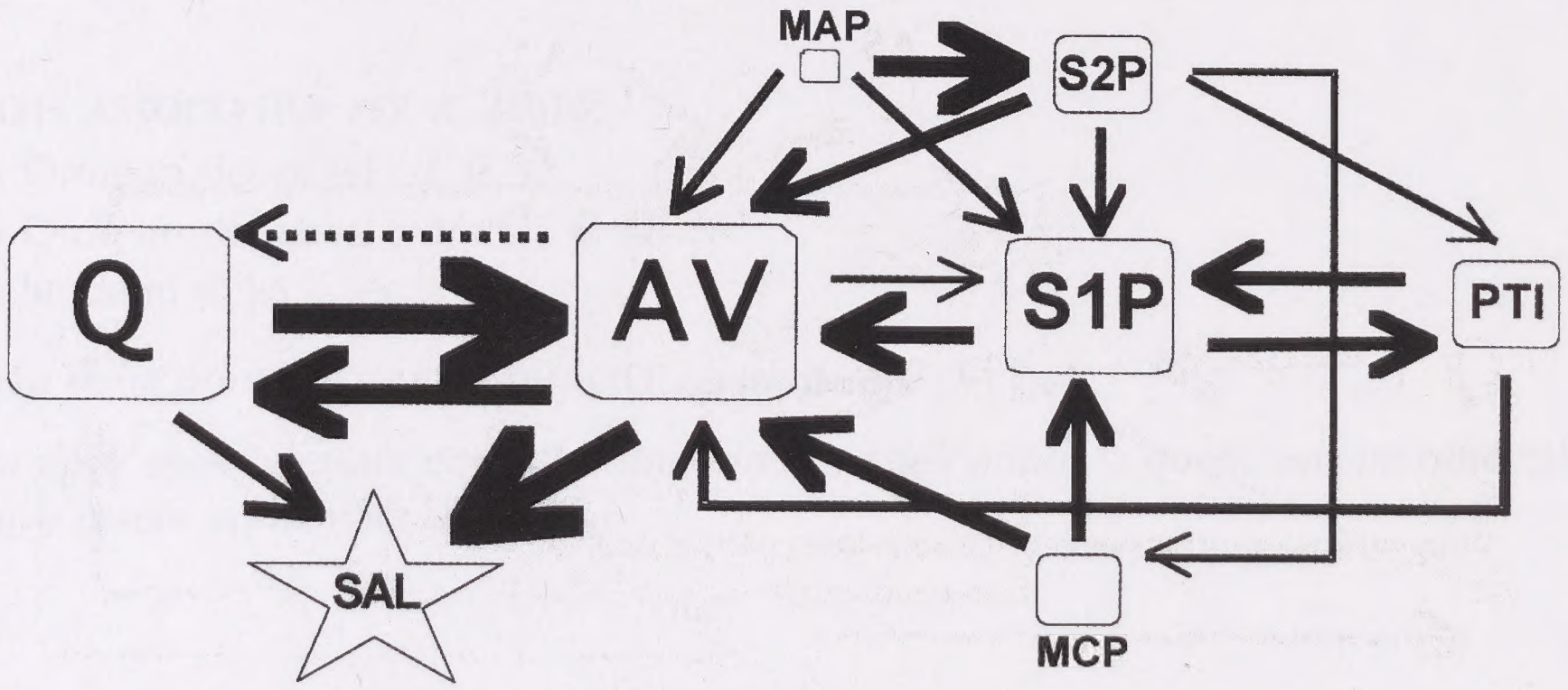
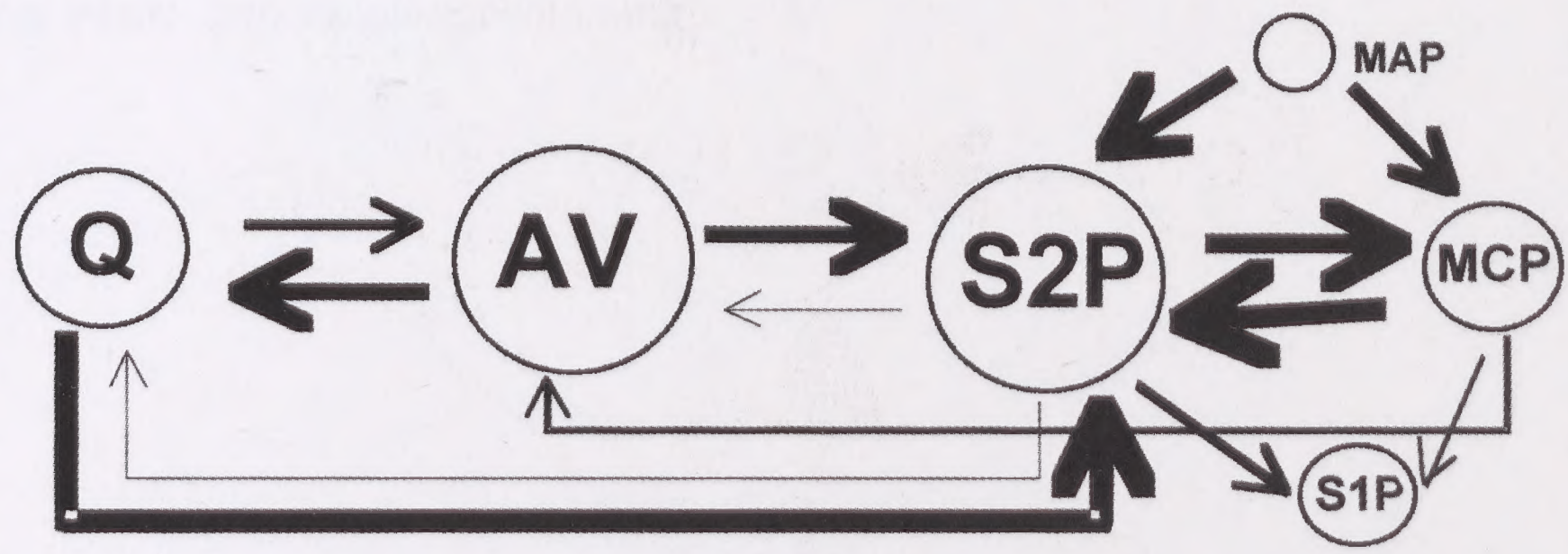


Fig. 3. Diagrama cinemático del comportamiento de machos interaccionando con hembras. **MCP:** Movimiento convulsivo de fémures posteriores. **MAP:** Movimiento alternativo de fémures posteriores. **S1P:** Subir y bajar uno de los fémures posteriores. **S2P:** Subir y bajar ambos fémures posteriores. **PTI:** Patada tibia. **AV:** Avance. **AS:** Aseo. **Q:** Quietud. **SAL:** Salto.
Fig. 3. Cinematic diagram of males behaviour when interacting with females. **MCP:** Quick and sudden movement of hind femora. **MAP:** Hind femora going up and down alternately. **S1P:** One of the hind femora goes up and down. **S2P:** Both hind femora going up and down at the same time. **PTI:** Kicking out with hind tibia. **AV:** Walking. **AS:** Cleaning. **Q:** Quietude. **SAL:** Assault.



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